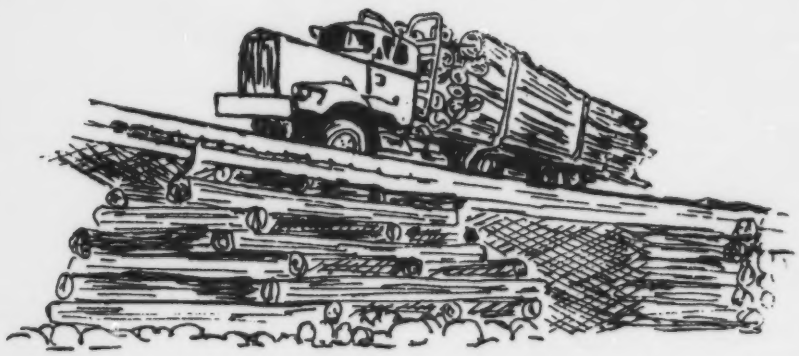
Okanagan Timber Supply Area
Integrated Resource Management
Timber Harvesting Guidelines

Water

February, 1992

Range



Harvesting

Recreation

Ministry of Forests

Fish and Wildlife

Okanagan
Timber Supply Area

Integrated Resource Management

Timber Harvesting Guidelines

February, 1992

British Columbia Forest Service

Okanagan
Timber Supply Area

Timber Supply Area boundary
Forest District boundary
Tree Farm Licence boundary

KEY MAP

SALMON ARM FOREST DISTRICT

TFL 33

Sicamous

Salmon Arm

TFL 49

VERNON FOREST DISTRICT

Vernon

TFL 49

Kelowna

PENTICTON FOREST DISTRICT

Penticton

Keremeos

TFL 15

NORTH

Preface

These Integrated Resource Management Guidelines for Timber Harvesting have been prepared to clarify the standards required for harvesting operations on Crown forest lands in the Okanagan Timber Supply Area and Tree Farm Licences 15, 33 and 49.

Interim guidelines were implemented in 1989 for an initial trial period. This revised edition reflects the input received from various resource users and members of the public. In addition, standards have been upgraded to reflect the goals and objectives for resource management in the 1990's. These guidelines are a statement of expected standards, where compliance is the norm rather than the exception. **On-site conditions may require modifications to address specific concerns, but this should be infrequent, and the changes should be consistent with the intent of the guidelines.**

Guidelines should be dynamic to reflect changing public values, increasing environmental pressures and evolving forest management practices. As a result, these guidelines will be reviewed on a regular basis and modified as required. The public, government agencies, interest groups and forest users will be involved in the on-going review process.

Acknowledgements

The Ministry of Forests wishes to thank the committee members from the Ministry of Environment, the Department of Fisheries and Oceans, Shuswap Okanagan Forest Association (represented by Fletcher Challenge Ltd., Bell Pole Ltd., and Gorman Bros. Lumber Ltd.) and Ministry of Forests staff who produced the original "interim" guidelines. The Ministry further acknowledges the individuals, special interest groups, other resource agencies, forest company staff and members of the public who assisted in preparing this second edition. The following individuals and groups submitted written input:

B.C. Wildlife Federation

Central Okanagan Regional District

Department of Fisheries and Oceans

Shuswap Okanagan Forest Association

Weyerhauser Canada

Winfield and Okanagan Centre Irrigation District

Ministry of Environment

Shuswap Environmental Action Society

Arnold Seigo

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Ministry of Forests District and Regional staff

The following Ministry of Forests staff were on the review committee for the second edition:

Dick Reimer	Chairman, Ministry of Forests, Penticton Forest District
Ron Beals	Ministry of Forests, Salmon Arm District
Rick Smith	Ministry of Forests, Vernon District

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Introduction

In order to fully understand these guidelines, and before making use of the information from a specific section, the user should read the Introduction, Purpose (Page 4), Concept (Page 5) and Basic Guidelines (Pages 9 to 50).

All forest harvest-related activities conducted in the Okanagan Timber Supply Area (TSA) must reflect the need to maintain the many resource values that exist or may be required in the future. The goal of these guidelines is to ensure that our future forests are vibrant and alive with the full variety of forest life and its processes, while at the same time promoting a vigorous and efficient forest industry.

Within the Okanagan TSA, forest management zones have been delineated where certain resource values, such as water, wildlife or timber, are particularly important. Within these zones, special measures must be taken to ensure that the particular resource values are protected and, where appropriate, enhanced. In addition to the use of guidelines for specific forest management zones, special measures are required throughout the TSA for the other values such as recreation and old growth that need to be dispersed through many parts of the forest.

With certain modifications to harvesting systems, cutting methods, timing and sequence of logging and other forest management practices, most sites can be harvested in a manner that is compatible with other resource values. Although these guidelines attempt to cover the normal range of situations encountered, there will be areas or activities that warrant special consideration. It is recognized that these guidelines do not completely address old growth dependent wildlife, caribou or grizzly bear, but they should lead to a variety of successional stages which should accommodate most wildlife and maintain wildlife species diversity.

There will be areas or activities where these guidelines will have to be adjusted or plans prepared to address important wildlife populations or habitats. Alternatively, they may need to be relaxed to accommodate pest

management activities or perhaps an innovative approach to some aspect of resource management.

It should be noted that the implementation of many of the guidelines set out in this document can be much easier facilitated through the adoption of the "total chance" concept of planning. Refer to FERIC Handbook No. 4 "Timber Development Planning for the B.C. Interior: the Total Chance Concept", 1983.

A sample of the available reference material is documented in the bibliography.

Technical terms used in this document are defined in the glossary.

Background

Until recently forest management practises have evolved with the Forest Service, other government agencies and the forest industry utilizing their own respective guidelines. These guidelines were developed as a result of the resource managers from these agencies and the forest industry recognizing the need to incorporate all the existing guidelines into one document. It has been recognized that existing guidelines needed strengthening or, in some cases, new guidelines needed to be developed. This document reflects this need. The guidelines have been developed over the past six years so that each agency and company operating in the Okanagan/Shuswap area will be operating according to common practises.

Ministry of Forests Planning Process

The *Ministry of Forests Act* Section 4(c) states the purpose and function of the Ministry in regards to integrated resource management is to:

"plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector."

The Ministry administers the ***Forest Act*** and the ***Range Act***. The ***Forest Act*** states that the Chief Forester will assess the land in the province for its potential for:

1. growing trees continuously;
2. providing forest or wilderness oriented recreation;
3. producing forage for livestock and wildlife;
4. conservation of wilderness, and
5. accommodating other forest uses.

To manage for timber, recreation and range the Ministry of Forests has divided the province into 35 "Timber Supply Areas". The Okanagan Timber Supply Area is one of these. It takes in all the watersheds that drain into Shuswap, Okanagan and Skaha Lakes plus additional areas. This is an area from the north of Shuswap Lake to the Canadian/American border. The Key Map shows the TSA.

The following diagram shows how the Timber Harvesting Guidelines fit into the Ministry's planning process. The guidelines serve to assist in the planning and implementation of all resource management planning stages within the TSA.

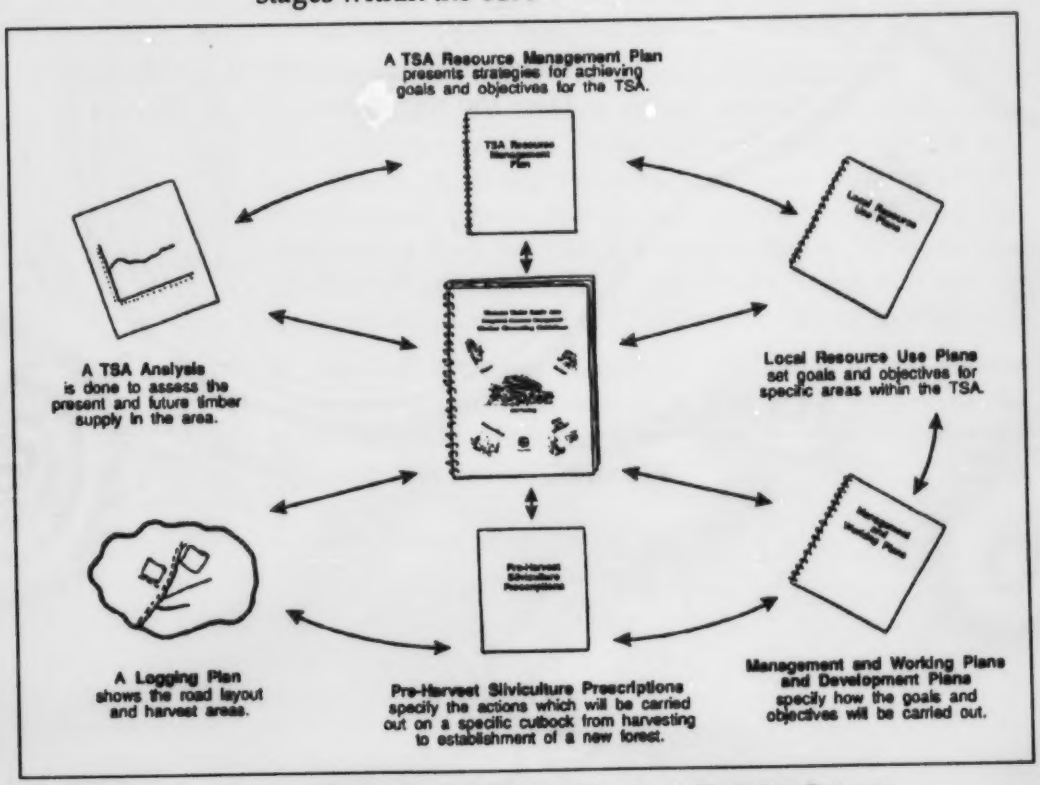

A TSA Resource Management Plan presents strategies for achieving goals and objectives for the TSA.
A TSA Analysis is done to assess the present and future timber supply in the area.
Local Resource Use Plans set goals and objectives for specific areas within the TSA.
A Logging Plan shows the road layout and harvest areas.
Pre-Harvest Silviculture Prescriptions specify the actions which will be carried out on a specific cutblock from harvesting to establishment of a new forest.
Management and Working Plans and Development Plans specify how the goals and objectives will be carried out.

Figure 1 Timber Harvesting Guidelines and the Ministry's Planning Process

Purpose of Timber Harvesting Guidelines

The guidelines provide an overall framework for integrated resource management decision making with respect to timber harvesting in the Okanagan TSA. The focus is on timber management because this activity has a major impact on fish, wildlife, soils, water, range and recreation. The guidelines contain recommended management practices that recognize the significance of other natural resource values and integrates them into the process of timber harvesting.

The guidelines should be used concurrently with present policies and legislation administered by the Forest Service, Department of Fisheries and Oceans and the Ministry of Environment. It must be recognized that guidelines are not regulations, they may or may not be defined in law, but they do outline what "should" be done. These guidelines are considered to be dynamic and will be revised as the public's values change, as demands on the environment change and as new forest management practises evolve. As such they can be a very effective tool in resource management as guidelines are often easier to change than laws and regulations.

The Concept of Resource Management Zones

To implement the timber harvesting guidelines the Timber Supply Area has been divided into five resource management zones. Where zones overlap the most stringent harvesting guidelines apply.

Basic Integrated Resource Management Guidelines for All Zones

These guidelines are the minimum management practices throughout the TSA. In the absence of the more stringent requirements of a particular zone, these guidelines apply.

Community Watershed Zone

In the Community Watershed Zone the priority consideration is the protection of the water resource. When conducted, timber management activities should provide for the maintenance of water quality, water quantity and timing of runoff. Compared to other watersheds, the rate of cut should be slower, cutblocks should be narrower to maximize shading, and they should be smaller.

More emphasis should be placed on silvicultural systems that maintain continuous forest cover and clearcutting should be designed to create a mosaic of tree species and age classes. Road right-of-ways and road surfaces should be narrower where quality can be maintained and soil disturbance from harvesting activities should be much less. More emphasis should be placed on decompaction and/or revegetation of exposed soil that may be prone to erosion.

In short, all activities should be conducted to the highest standards practical, considering that water is one of the most valuable resources we have in the Okanagan/ Shuswap and British Columbia.

Ungulate Winter Range Zone (Deer, Sheep and Elk)

The dominant consideration in the Ungulate Winter Range Zone is the maintenance of the winter range resource for ungulates, including cover and forage. The intent is to maintain or enhance forage production by dispersing the harvest throughout the winter range and by spreading it out evenly over the rotation in as many passes as possible.

Ungulate winter range areas are identified on the Canada Land Inventory (CLI) maps for Wildlife Ungulates and are typically CLI Classes 1W, 2W, 3W and 2W-3W. Significant portions of these units are open range and rock, and portions of the forested range are non-winter range areas that are impractical to delineate at this level of mapping. Other winter range areas will be identified as habitat inventory is upgraded. Field inspections to clearly define the winter range may be required.

The winter range guidelines apply to approximately 50,000 ha of productive forest land or 2.2% of the entire Okanagan TSA. Over 75% of the winter range zone is in types where selection logging is a viable option.

The Ungulate Winter Range Zone pertains to deer, sheep and elk only. Moose winter range requirements should normally be accommodated by the Basic Guidelines for All Zones.

Lakeshore Zone

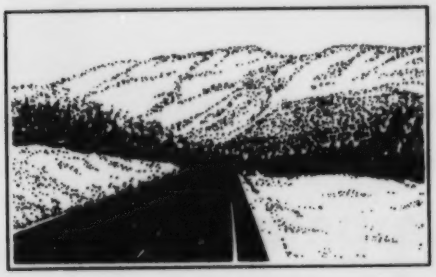
The Lakeshore Zone applies to the upland lakes within the Okanagan TSA. The large lowland lakes are outside the scope of these guidelines.

The Lakeshore Zone is the forested area within 200 metres of the riparian area surrounding category "A", "B", and "C" lakes. The 200 metre area may be further extended where needed to maintain values on specific lakes. Appendix 6 shows a list of "A", "B", and "C" lakes in each Forest District.

Harvesting within the majority of lakeshore zones can be compatible with other resource values. However, the type and amount of harvesting needs to vary according to the qualities of each lake. Consequently, the guidelines developed for each category of lake take into consideration

such things as degree of use, angler effort, productivity, recreational value, aesthetic value and hydrological importance. Category A lakes are recognized as having the highest values while C have the lowest.

Landscape Management Zone



The emphasis in this zone is to minimize the visual impact of logging along corridors where people live, work, recreate and travel. The zone is divided into four subzones depending on whether the visual quality objective of the natural landscape is for preservation, retention, partial retention or modification.

Timber Harvest Emphasis Zone

This zone includes all areas in which there are no major conflicts with community water, ungulate winter range, lakeshore management and landscape management. The emphasis in this zone is for the long term optimum harvest of forest products while protecting basic resources. In this zone the Basic Integrated Resource Management Guidelines apply.

Basic Integrated Resource Management Guidelines for All Zones

Basic Integrated Resource Management Guidelines for All Zones

These basic guidelines are the minimum management practices throughout the TSA. In particular, they represent the primary harvesting standards for the Timber Harvest Emphasis Zone. **In the absence of more stringent requirements within a specific Zone, these guidelines apply.**

Harvesting

General

In order for all values to be adequately integrated and for the planning process to work smoothly, planning for all harvesting passes should be carried out on a "total chance" basis.

The objective within all zones of the Okanagan TSA is to ensure that all resource values and biological diversity are maintained during harvest related activities. To a certain extent, this can be accomplished by varying the size and shapes of cutblocks and reserves. It may also be accomplished by taking advantage of suitable alternative silvicultural opportunities, such as selection, shelterwood and seedtree harvesting systems. In addition, this can be accomplished by removing timber in 3 or more passes, with no more than 30% of the forested area removed in one pass. After one pass, the area should be "greened up" before the next pass.

Overall percentage of mature cover

» A minimum of 20% of the mature size cover (more than 20 m in height) should be maintained and dispersed throughout each planning cell as existed at the time of the 1986 re-analysis. These units may be

replaced throughout the planning unit as immature timber becomes mature.

Preferably the patches of mature cover should be represented in each unit of 400 ha. The patches of mature cover should help to link together stands of old growth or important wildlife areas. The smallest dimension of these patches should be at least 300 metres.

Mature forests provide habitat requirements for a variety of wildlife species and a variety of recreational opportunities. Conversion of large tracts of mature forest into younger stands would severely impact wildlife species that require older growth for at least part of their life cycle (feeding, breeding, cover, etc.).

Clearcut Logging

Cutblock size

» The maximum average cutblock size per cutting permit should be less than 30 ha. Individual cutblocks should generally be less than 30 ha, but in some cases up to 50 ha may be acceptable.

Cutblock down slope width

» The average down slope width of the cutblock should be a maximum of 400 m.

Reserve width

» The reserve width between cutblocks should be a minimum of 400 m. The distance between corners of adjacent cutblocks may be modified to suit on-site conditions if wind firmness of the reserve is not reduced.

Higher elevations

» Clearcut openings within higher elevation portions of the Englemann Spruce Subalpine Fir biogeoclimatic zone should be reduced significantly in consideration of the severe climatic conditions. Above 1700 m elevation, no one silvicultural system should be used to the exclusion of others until consistent, reliable reforestation results to the free-growing stage have been demonstrated.

Cutblocks < 20 ha

» Where cutblocks are less than 20 ha, reserve width may be reduced to a minimum of 300 m but should be kept at least as wide as the widest cutblock on either side of the reserve.

Cutblocks < 5 ha

» Where cutblocks are 5 ha or less the reserve width can be modified provided windfirm strips remain and no more than 30% of a given unit of forest area is removed.

Reserve block harvest

» When the greenup criteria on adjacent clearcut areas have been achieved, reserve blocks/strips may be harvested. Partial cutting should not be used to accelerate this process.

- For the purposes of these guidelines, greenup is defined as the stage of regeneration of a logged area where there is a satisfactory stocking of established tree species acceptable to the site that have reached a height of at least 3 metres. Stocking shall meet the standards specified by the Ministry of Forest.

Non-forest openings

» Existing openings such as cleared private land, transmission lines and highway right-of-ways should be considered when applying the intent of the above guidelines.

Cutblock boundaries

» Cutblock boundaries should follow road patterns and/or natural features such as timber types, slope changes, and other topographic features. Where risk of blowdown is high, boundaries should be feathered.

Maximum harvest within watersheds

» Harvesting in any watershed should not have a significant negative effect on the water resource. To achieve this end, the maximum area harvested in any watershed since 1965 should not exceed 30% clearcut, or in the case of partial cuts, 30% Equivalent Clearcut Area (ECA) of the total forested watershed area (see the explanation on page 12). In community watersheds this level of cut should not exceed 20%. The District Manager may designate different harvest levels for different watershed sensitivities (e.g. watersheds of regionally significant fish streams). These are listed in Appendix 1. The total watershed area includes private land.

This guideline is intended to minimize the risk of damaging changes to the hydrograph (streamflow quantity and timing) from the cumulative effects of forest cover removal.

A watershed is defined as the area of land draining into a stream above a critical point in that stream. The critical point might be a domestic intake, a stream confluence, a fish spawning area or any point at which the cumulative effects of upslope activity could impact a water user or cause significant damage to the stream channel. Where the critical point of a watershed is not known, the guideline should be applied to any subdrainage that is 1,500 ha in size or larger.

Exceeding watershed limit

» For harvest proposals exceeding the designated harvest level, a cumulative watershed impact assessment should be completed. A watershed impact assessment should also be completed prior to any activity in undeveloped watersheds.

The criteria for watershed assessments will be provided by the Ministry of Forests' Hydrologists. These criteria will be described in an Operational Guide to Hydrologic Assessment of Southern Interior Watersheds which is currently under development. Typical watershed planning considerations include:

- balancing harvest by aspect and elevation,
- evaluation of surface erosion and slope/channel instability, and
- assessment of hydrologic recovery.

Equivalent Clearcut Area

Equivalent Clearcut Area (ECA) refers to the amount of harvested forest land within a watershed, which, hydrologically, acts like a clearcut.

For example, a ten ha clearcut represents 10 ha of ECA when it is first logged. Normally, as a cutblock revegetates, the ECA decreases. However, within the context of the previous two guidelines, the effect of revegetation will not be considered. That will be part of the cumulative watershed impact assessment.

Figure 2 should be used to calculate the ECA for that portion of the watershed that is in selection and other partial cuts. For example, a 10 ha **selection** block with 50% of the crown closure removed, equals 40% ECA or 40% X 10 ha = 4 ha of ECA.

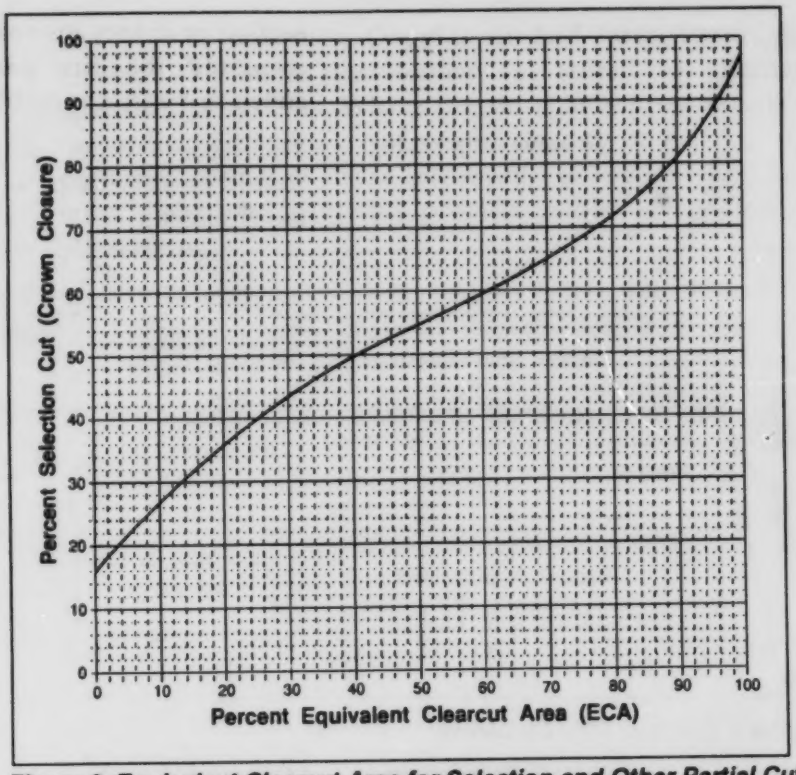


Figure 2 Equivalent Clearcut Area for Selection and Other Partial Cuts*

*Forest Hydrology - Hydrological Effect on Vegetation Manipulation, Part 2, A Working Manual, U.S. Forest Service, Northern Region, Missoula, Montana, - Russell

Clearcut Contour Logging

Contour strip logging is generally applicable on sideslopes where the parallel road system will result in less total road construction and lower overall road grades. Generally this system is not compatible where patch logging patterns have already been established.

Total Chance Planning » Total chance planning is a prerequisite for contour strip logging.

Contour orientation » Contour logging should be in narrow strips oriented along the contour.

Average width » The average down slope width should be 300 m slope distance or less to optimize yarding distances and minimize the amount of road construction. The width should be increased where cable harvesting (uphill and/or downhill) can be used to eliminate a road

section or reduce the road density. Where the width is increased, the "first pass" block size should remain consistent with the cutblock size objectives.

Reserve strip width

» The reserve down slope width between cutblocks should be as wide or wider than the average width of the cutblocks.

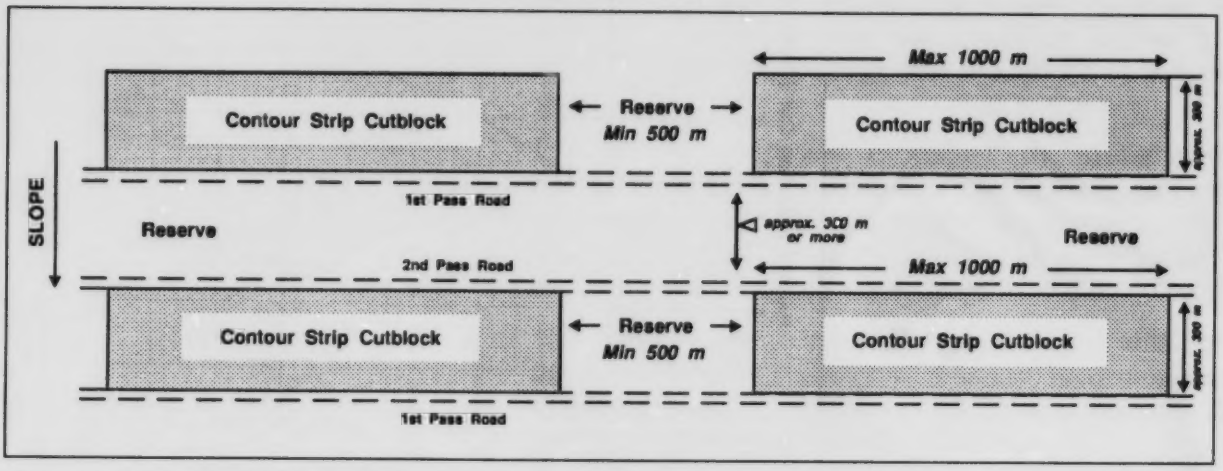


Figure 3 Contour Strip Cutblocks

Strip length

» Maximum length of the clearcut strips is 1,000 metres along the contour.

Reserve length

» Minimum reserve length between cutblocks is 500 m along the contour.

Selection and Other Partial Cutting

Selection, shelterwood and seedtree silvicultural systems should be used to the extent needed to achieve such management objectives as tree species diversity, maximum growth and yield, natural regeneration and provision of long-term management options for piece size, rotation period and final product.

These "alternate" silvicultural systems should be used in high use or sensitive areas where the impact of harvesting should be minimized to protect other resource values. This is especially important in areas that have been heavily clearcut or are threatened by excessive damage from pests.

Dry belt or transition Douglas fir and larch stands are especially, though not exclusively, suited to alternate silvicultural systems. Where certain stands present falling or yarding difficulties, or slash levels may be high, or the preferred species is shade intolerant, group selection and strip shelterwood systems provide viable alternatives to clearcutting.

Crown closure < 50%

» If the crown closure is reduced to less than 50% of the natural crown closure, the clearcut cutblock size constraints will apply.

Size of overstory removal cuttings

» The area of overstory removal cuttings in a shelterwood prescription are governed by the clearcut block size guidelines.

Revegetation

Revegetation such as grass seeding is carried out primarily to reduce the impact that erosion of exposed mineral soil can have on water quality. The plant residue and roots also improve the soil structure and water infiltration of severely compacted sites.

Exposed mineral soil that may erode should be grass seeded. This occurs mainly on right-of-ways, fireguards, landings and some skid roads. Some very unstable areas may require the establishment of woody vegetation (i.e. willow). On many of the sites that require seeding, the productive soil horizon has been removed and fertilization will be required. On severely nutrient deficient sites, more than one application of fertilizer may be necessary.

Stabilizing soil disturbance

» Soil disturbance is considered stabilized when 70% of the disturbed area has established grass growing on the site within 1 year of final disturbance.

Minimize soil erosion

» All exposed mineral soil on landings, right-of-ways, fireguards and designated skid roads should be seeded as soon as possible to minimize soil erosion and restore productivity.

Revegetation Site Preparation, Timing, Species and Rate

Details on various aspects of revegetation are outlined in Appendix 3.

Experience will prove what works and what does not - the most suitable methods will be identified in updates to this section. The objective is to revegetate these sites at the least possible cost.

Riparian Areas

Riparian areas are the banks of streams, rivers, lakes and wetlands. These areas have high water tables and wet soils, often with associated water-loving plants. Riparian areas are very important to fish and wildlife and contain the highest number of species of flora and fauna.

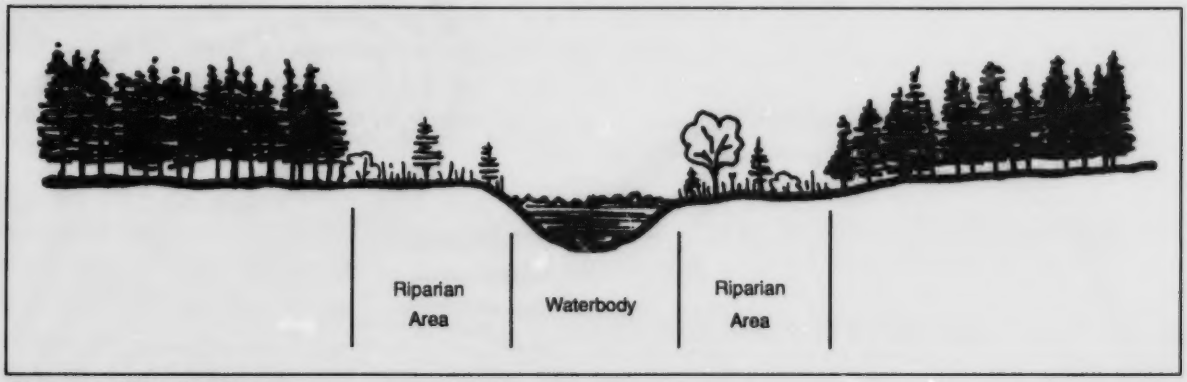


Figure 4 Riparian Areas

These guidelines are in two parts. The general section contains guidelines for all riparian areas, regardless of size or type of water body. The main objective here is to maintain the banks of waterbodies and protect the soils and understory vegetation from damage.

The second section pertains to swamp complexes and the portions of streams that are particularly important for fisheries and/or water production (as well as wildlife, recreation and other values). Along these waterbodies, an adjacent strip of upland forest vegetation is incorporated with the riparian area to create a Riparian Management Subzone. The purpose of the subzone is to maintain a wind-firm strip of forested vegetation that is sufficient to

protect the riparian area and associated resource values such as fisheries, wildlife and water.

Forest cover is required along streams to maintain pre-harvest water temperatures and provide a long term source of large organic debris. Shade is necessary to minimize stress to fish resulting from high water temperatures. Elevated water temperatures and increased sunlight promote the growth of undesirable aquatic plants which can diminish water quality. Overhanging root systems and large organic debris also maintain stream stability and contribute to fish habitat by creating small pools and gravel accumulations. These structures are replaced periodically by windfalls from the adjacent vegetation strip.

Forest cover is required along swamp complexes to protect wildlife, biodiversity, water and recreation values that are focused on these areas. Additional guidelines for lakes are found under the Lakeshore Zone section (page 56) and for swamps under the Wildlife and Biological Diversity section, (page 23).

Harvesting

The following general guidelines apply to all riparian areas.

General

No-machine buffer

» Equipment should not be operated within 20 metres of streams and other waterbodies (no-machine buffer).

Nonmerchantable vegetation

» Leave all nonmerchantable vegetation within no-machine buffers.

Integrity of buffer

» The integrity of no-machine buffers along all streams and other water bodies should be maintained through post-harvest treatment (i.e. do not broadcast burn

buffer, do not 3 m slash the buffer) unless the licensee is prepared to plant the buffer within the first season after harvest with large or rapidly growing planting stock.

Stumps and roots

» Stumps and root systems and any logs embedded in stream banks should not be disturbed.

Falling and yarding near waterbodies

» Trees should be felled and yarded away from streams and the riparian areas associated with other waterbodies.

Small streams for block boundaries

» Where feasible, use small streams for block boundaries instead of logging both sides.

Swamps

Vegetation along swamps

» Unmerchantable growth within the wetted perimeter of any swamp should be retained.

Islands within swamps

» Forested islands containing timber located within major swamp complexes should be reserved from harvest.

Openings along swamps

» Not more than 30% of the forest perimeter adjoining any swamp complex should be in a non greened-up state. The riparian areas guidelines and Riparian Management Subzone guidelines apply to swamp complexes.

Roads and swamp complexes

» Roads should be located outside of the Riparian Management Subzone associated with swamp complexes.

Riparian Management Subzone

The Riparian Management Subzone guidelines apply to swamp complexes greater than 2 ha, and the mainstream of watersheds greater than 1,500 ha. The mainstream is defined as the main channel extending upstream to the point where channel width diminishes to less than 0.6 metres. These guidelines also apply to significant fish bearing reaches of streams that do not fit the preceding criteria, but they do not apply to ephemeral streams. These guidelines are in addition to the general guidelines for riparian areas above.

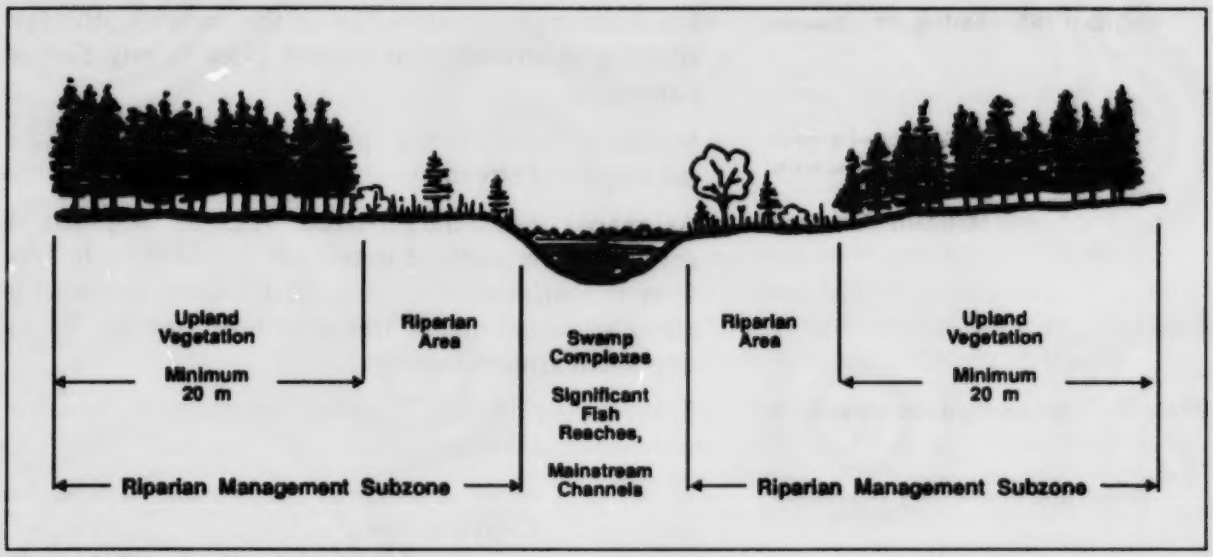


Figure 5 Riparian Management Subzone

Forested strip

» A wind firm strip of forested vegetation should be maintained along both sides of streams in the Riparian Management Subzone, significant fish bearing reaches, and around swamp complexes greater than 2 ha. The forested strip should be at least 20 m wide (on each side of the riparian area of the waterbody). The strip should be sufficiently wide that only **natural** blowdown should occur adjacent to the waterbody.

Harvesting

On particularly sensitive streams and portions of streams, no harvesting is permitted within the Riparian Management Subzone. These streams are listed in Appendix 4.

Selection and Other Partial Cutting

Selection only

» Clearcut logging is not permitted within the Riparian Management Subzone.

Maintain 75% shading on streams

» Maintain approximately 75% of the summer mid-day shading of streams that existed prior to any timber harvesting.

Maintain 50% of pre-harvest crown closure

» Maintain 50% of the pre-harvest crown closure (swamps and streams).

Maintain size class

» As many of the larger-sized trees as is practical should be retained and in no case should there be less than the original size class distribution (especially along streams -- large tree retention may not be as important around swamps).

Embedded roots systems

» Leave trees which display large root systems embedded in stream banks.

Brush and understory vegetation

» Brush and other understory vegetation should be protected (all waterbodies).

Adjacent Clearcut Logging

Cutblock length along streams

» Cutblocks along the Riparian Management Subzones of streams should be less than 600 m in length.

Reserve lengths

» The reserve between cutblocks along streams should be a minimum of 400 m.

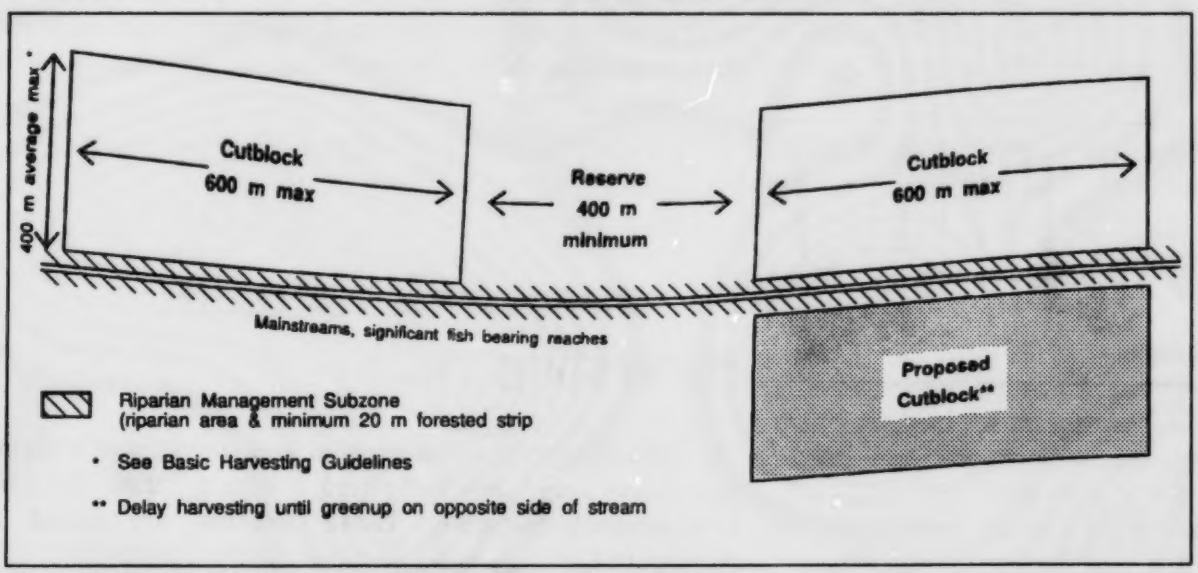


Figure 6 Cutblock Pattern along Riparian Management Subzone

Cutblock pattern

» Concurrent cutblocks on opposite sides of the Riparian Management Subzone of a stream should be avoided. The opposite or adjacent stand may be

harvested once greenup has been attained on the original cutblock.

Range

Almost all of the Southern Okanagan has been under Range tenure for a number of years. Not all of the North Okanagan is currently used but as more areas are opened by logging roads, new range tenures may be allocated. These guidelines pertain to areas under range tenure.

It is recognized that logging generally has a beneficial impact on the forage supply because of the response of herbage to the opening of the forest canopy. Increased access due to roads and placement of cutblocks are sometimes beneficial to range management, but may on many ranges severely impact the ability of ranchers to handle their livestock.

The purpose of the guidelines from a range perspective is to reduce the possible negative impacts of logging and allow for the optimum forest related range use.

Harvesting

General

Travel corridors for livestock

» Historic travel corridors for livestock such as stock trails and old road beds should be maintained through logged areas or trails should be built to mitigate the loss of original corridors.

Timing of harvest

» Timing of timber harvest and livestock movements should be coordinated to reduce conflicts.

Range over-use

» Where harvesting may lead to over-use of range in young plantations, the potential conflict should be resolved during the planning phase. The Ministry of Forests' range agrologist should be consulted to work

out a solution which may involve fencing or movement of cattle.

Natural barriers to livestock movement

» Where it is difficult to control cattle once access is made, cutblock patterns should be designed to avoid loss of natural barriers as long as possible. In some cases it may be necessary to defer logging until fencing can be done to control cattle movement out of traditional areas.

Protect livestock watering areas

» Developed livestock watering areas should be protected.

Construction timing in range areas

» Where possible, roads should be constructed and road banks seeded two years before logging to allow ranchers time to revise existing range management plans for the area.

Watering ponds for livestock

» Where possible, small stock watering ponds should be created by digging an extra deep waterbar or by not draining suitable loading trenches.

Wildlife and Biological Diversity

In present day managed forest ecosystems the natural processes of fire, insects, disease and blowdown are greatly reduced and this may negatively impact on the habitat requirements for wildlife. It is important that resource users, the Forest Service and the Ministry of Environment work closely together and strive to provide adequate habitat diversity.

Harvesting

General

Silvicultural systems

» In order to achieve biological diversity at a level smaller than watersheds but larger than cutblocks, it may be necessary to occasionally vary cutblock patterns and silvicultural systems.

Old Growth

The Provincial Old Growth Strategy Project is working on identifying and implementing the old growth timber requirements for the Province. The following interim guidelines are designed to ensure that options for maintaining old growth are not lost during current harvest planning processes.

These guidelines are not intended to permanently reserve old growth timber, but rather to ensure that sufficient and suitable old growth units will be available to effectively apply the Old Growth Strategy, once it has been determined. At that time, any surplus old growth units identified by this process will be deemed available for harvesting.

Percentage old growth

» 10% of forest producing sites should be maintained at any one time as old growth. The old growth stands in

parks, ecological reserves, etc. are included in this 10% figure.

The age at which old growth develops and the specific structural attributes that characterize old growth will vary widely according to forest type, climate, site conditions and disturbance regime. However, old growth is typically distinguished from younger growth by several of the following attributes:

- large trees for species and site;
- wide variation in tree sizes and spacing:
- accumulation of large size dead-standing and fallen trees:
- multiple canopy layers:
- canopy gaps and understory patchiness
- decadence in the form of broken or deformed tops or boles, down-logs and root decay (Franklin, 1989).

Old growth distribution

» The 10% old growth should be distributed throughout the Provincial Forest, such that at least 10% of each 4,000 ha unit is managed as old growth were it exists. Where 10% does not exist, consideration should be given to future recruitment of old growth from mature stands.

Preferred areas for old growth have a high degree of biodiversity and, where possible, they should be interconnected by areas of mature cover, riparian zones, partial cut areas or other mature forest cover.

Old growth unit size

» Old growth units should vary in size, but should be no less than 50 ha with the smallest dimension at least 500 m. Larger units provide the greatest value, but smaller units may be acceptable in areas that have already been heavily fragmented.

Wildlife Trees

Wildlife tree guidelines apply to all timber types within the TSA with the exception of large stands of pure lodgepole pine (greater than 500 ha). These pure lodgepole pine stands have a lower overall species diversity. In these areas the needs of cavity nesters will have to be provided in riparian areas, lakeshore zones, wildlife migration corridors, etc. In addition, some habitat may be provided

by short "stub" snags which may be created during mechanical harvesting operations.

Stub snags are dead trees with broken tops. WCB regulations require that stubs from dead trees be less than 3 m height in harvested areas. Stub snags can also be created from green trees at heights greater than 3 m by cutting them with mechanical fellers as high as safely possible (3.5 to 4.5 m).

First pass logging

» Under normal operating conditions, wildlife trees will not have to be reserved during the first logging pass, but potential wildlife tree patches should be planned.

Wildlife tree patches

» To accommodate the varying needs of cavity nesters, a minimum of 1 patch of mature timber (not second growth) should be provided for every 50 hectares of logged area (clearcut and partial cut). These patches should be a minimum of 2 hectares in size and located within the cutblock or contiguous to it. Preferably, patches should be located in areas that are inaccessible to firewood cutters.

Wildlife tree patches may be selected from areas that would not normally be harvested, such as forested rocky bluffs, deciduous and other problem forest types, Environmentally Sensitive Areas, riparian areas, and lakeshore zones. However, if the patches are located along the edge of cutblocks (rather than well within them), they should receive a "non-harvest" planning designation to avoid accidental logging in the future. Even in selection logged areas, WCB regulations require the felling of all snags.

Snag component

» As a rule of thumb, wildlife tree patches should contain at least 15 to 20 suitable snags:

- leave areas should represent areas with the highest density of existing snags and the potential for snag replacement (wolf trees, trees with dead tops, stubs). Areas of mixed forest types would be preferable to single specie areas. Patches should be evenly spatially distributed.
- if required, snags may have to be created to provide an adequate number for cavity nesters.

Snags can be created by topping, inoculation of fungus, etc.

- any snags leaning out from the patch and capable of reaching the work area will have to be felled for safety reasons.

Selection logging and alternatives to patches

» Wildlife tree patches are considered to be more suitable for most species of wildlife than disbursed trees within a clearcut block. However, where patches are not feasible, disbursed trees may be substituted in clearcuts and partial cuts (selection) as follows (rough rule of thumb):

- at least 2 potential snags (class 2 wildlife trees) per hectare. These trees have green branches but are in poor condition and will generally die in 20 to 30 years.
- at least 2 wolf trees per hectare. (class 3 wildlife trees). These trees are green throughout and will become a snag in 80 to 100 years.
- at least 1 stub snag per hectare.
- at least 2 snags per hectare (created artificially, i.e. topping live trees after harvesting is completed).

Disturbance - Roads, Skid Roads, Landings, Fireguards

The construction of roads and other structures is usually associated with deep disturbance and deep compaction which may cause degradation of forest sites and other resource values.

Pre-Harvest Silviculture Prescriptions are required to specify the amount of logged area that may have the site productivity reduced by roads, landings, fireguards, back spar trails and skid roads. The Interior Forest Harvesting Council is presently addressing this subject. Provincial interim standards are in Appendix 2. See also the Land Management Handbook - Developing Timber Harvesting Prescriptions to Minimize Site Degradation (T. Lewis et al., 1989).

Roads

Of any timber harvesting activity, roads potentially have the single greatest impact on the environment. One of the prime objectives of these guidelines is to assist in building roads which are in the best location with the least environmental impact.

Construction

For further information on road construction standards refer to the Bibliography.

For water quality to be protected, proper construction methods should be employed. While roads should be constructed in the best building locations, it is desirable to keep them as far from watercourses as possible. A vegetated strip will help protect the water course by filtering out sediment from the road surface runoff and providing shade.

Location of roads

» A vegetated buffer strip, minimum width of 20 m, should be maintained from the high water mark along all streams, swamps and lakes. Roads that parallel a stream should be located outside of the Riparian Management Subzone and in no case less than 20 m from the stream.

Placement

» These guidelines should not preclude placing a road in the best possible location for minimizing any negative impacts on the environment.

Side-Cast Material

Since most construction takes place on slopes, there is a risk of side-cast material travelling downslope into a watercourse.

Side-cast material clear of buffer

» Roads should be situated so that the toe of the side-cast material is clear of the buffer strip.

Slope 65% or greater

» Where the slope is 65% or greater full-bench construction and end-hauling should be considered. Construction in these areas should be discussed with the district engineering staff.

Stream Crossings

The objective of installing stream crossings is to ensure the continuation of the natural drainage patterns. To meet this objective, the structures need to be of sufficient size. Significant increases in stream flow (i.e. up to 60%) can be expected from new clearcuts.

25-year flood

» As a minimum, stream crossing structures should be sized to pass the flow from a 25-year flood. For long term roads, or where debris hazards exist, flows should be increased accordingly.

Fish bearing streams

» Stream crossing structures should be sized to pass the flow from a 50-year flood or greater for fish bearing streams.

Culvert Sizing for Small Streams

Where possible, actual stream flow data, historical observations, etc. should be used to estimate the 25-year flood on a site specific basis. The following procedure should be considered as a "rough rule of thumb" until it has been either confirmed or modified based on extensive field testing:

1. determine the cross-sectional area of the channel at the proposed crossing, up to the natural boundary in square metres (m^2);
2. for mountain streams assume a water velocity at flood flows to be 0.9 m per second (m/s);
3. stream flow Q (m^3/s) equals velocity V (m/s) times the cross-sectional area A (m^2) ....$Q = VA$
4. Approximate conversion factors for increasing Q are as follows:

To increase Q to	Multiply field estimated Q by
25 year flood	4
50 year flood	5

5. Adjust the design flow for hazards. This requires considerable judgement and knowledge of the conditions. The following is a guide:
   a) low fill over area of low impact - no increase.
   b) Plugging due to floating debris and the impact of failure is acceptable - double the flow.
   c) Plugging due to debris torrent and the impact of failure is acceptable - increase flow by five times.
   d) In areas where the impact of failure is unacceptable - above method is not applicable. Further investigation is required, or install a bridge.
   e) For crossings where a large water empoundment will result should the culvert plug - above method is not applicable. Further investigation is required.

The flow capacity for given culvert diameters are listed in the following table.

Table 1
Culvert Capacities

Diameter (mm)	Diameter (inches)	Maximum Flow (m^3/s)	Maximum Flow (ft^3/sec)
400	16	0.1	4
500	20	0.2	6
600	24	0.3	11
800	30	0.6	20
900	36	0.9	32
1000	42	1.3	46
1200	48	1.8	65
*			
1600	60	3.3	115

Notes

* Culvert 1600 mm diameter and larger to be certified by a Professional Engineer and require an Approval under the Water Act.
Culverts should be located and installed according to the "Kamloops Forest Region Standard Specification for Construction of Roads".

Locate during high flows
» Specific culvert locations should be identified during high flows.

Operation of equipment
» Within the wetted perimeter of the stream (in-stream work), the operation of equipment must be kept to a minimum.

Seasonal restrictions to instream work
» In a fish bearing stream or tributary, instream work may be subject to seasonal restrictions or other provisions.

Construction debris
» Construction debris should be kept out of stream channels to reduce jam formation and resulting erosion.

Minimum distance from intakes
» Stream crossings should be located a minimum distance of 300 metres above a licensed intake or as negotiated between the permittee and the water licensee.

Rip-rap protection
» Inlets and outlets of culverts should be protected with rip-rap if there is potential for erosion.

Bridges

Abutments » Spans of bridges used as stream crossings should be designed with a span sufficient to allow the abutments to be placed away from the high water mark.

Unrestricted flood flows » Adequate cross-sectional area under the bridge must be provided so that flood flows pass unrestricted.

Rip-rap protection » Abutments should be protected with rip-rap if there is a potential for erosion.

Ditches and Cross Drains

The management of intercepted surface runoff requires that ditches be constructed for all roads.

Ditch depth » Ditches should generally be .3 m or more in depth.

Ditch discharge » Ditches should not discharge directly into a stream but should be routed onto the forest floor so that sediment can settle out. For those portions of a ditch which must discharge into a stream, the lengths should be kept as short as possible and a sump constructed immediately adjacent to the stream.

Slumping problems » Care should be taken to avoid areas where slumping problems could occur (e.g. by discharging onto sites that are conditioned to carrying water).

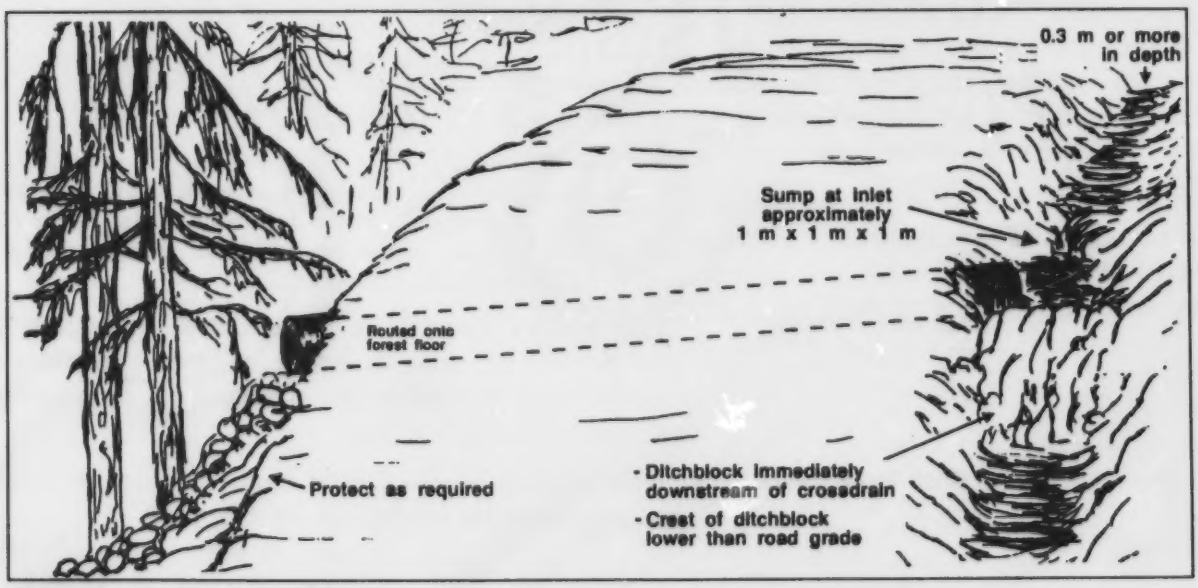

0.3 m or more in depth
Sump at inlet approximately 1 m x 1 m x 1 m
Routed onto forest floor
Protect as required
- Ditchblock immediately downstream of crossdrain
- Crest of ditchblock lower than road grade

Figure 7 Construction of Ditches

Sufficient cross drains should be installed to minimize ditchline erosion. To evaluate the potential for ditchline erosion, one is essentially assessing the mobility potential of the ditchline material. Erosion potential can be determined by assessing the following:

Erosion potential assessment

- **Compaction** of the parent material;
- **Texture** - size and shape of soil particles;
- **Gradient**;
- **Detachability** - a measure of the accumulation of fines in the ditch at the base of the cut slope; and
- **Mobility** - related to particle density and texture e.g. a coarse heavy sand particle, although highly detachable, will not travel as far as a clay particle.

A guide to the maximum suggested spacing interval for cross drains is shown in the following table.

Table 2
Suggested Spacing Intervals for Cross Drains

	EROSION HAZARD*		
	LOW	MODERATE	HIGH
Road Gradient	Rock	Gravel, Cobbles Hardpan, Glacial Till	Sands, Silts Clays
0 - 3%	350 m	300 m	250 m
3 - 8%	250 m	200 m	150 m
8 - 15%	200 m	150 m	100 m
> 15%	150 m	100 m	< 100 m

Notes

* More than 50% by soil type

This table is a general guide only. It is recognized that there are many factors that would cause adjustment to the suggested spacing. Flexibility in culvert placement to suit site specific, localized conditions will be recognized.

Ditch block location

» Ditch blocks should be constructed immediately downstream of cross drains. The blocks should be capable of withstanding the effects of running water and be resistant to erosion.

Ditch block crests

» Crests of ditch blocks should be lower than the road grade to allow for emergency overtopping.

Ditch sumps » A sump should be constructed at the inlet to the drain. It should be of a size that can be readily cleaned using mechanical means, at least 1 m X 1 m X 1 m. Site specific conditions may warrant a larger or smaller sump as required.

Rip-rap protection » Outlets of cross drains should be protected with rip-rap if there is potential for erosion.

Winter Roads

Winter roads are low standard roads constructed to provide short term access to a given area. When properly carried out, winter road construction will allow for less expensive construction, less site disturbance and access to areas that otherwise might not be available for harvest.

Planning/location criteria » Winter roads should be planned and located following the same criteria as other roads.

Subgrade preparation » Winter roads should consist of the minimum rough subgrade preparation that site conditions will allow. Cuts and fills should be minimized with the running surface being composed of as much compacted snow as possible.

Drainage structures » Drainage structures are required to be installed in accordance with the guidelines in this section but should be removeable under winter conditions. Drainage structures should be removed following the completion of harvesting but before spring breakup. Culverts and small structures can be removed more easily if logs are placed in the road surface adjacent to the culverts which can then be "broken out".

Final condition » Winter roads should be left in such a condition that run-off water can flow across them. They should not become stream channels. Once a winter road breaks up it is extremely difficult to access and repair any drainage problems that may occur.

Road Maintenance

Road maintenance is an ongoing process that should continue until such time as a road is deactivated. Good maintenance will help reduce the cost of hauling and upkeep and is important in protecting water quality.

Unless a road has been formally deactivated it will require ongoing maintenance. Whether or not the road is actively used to haul logs there is a responsibility to maintain the running surface, stream crossings and drainage works.

These measures should be taken prior to freeze-up on a seasonal basis:

- **Right-of-way** - brushed out as required to maintain ditches, to promote early drying out and to maintain safe sight distances;
- **Ditches** - clear of boughs or debris, capable of passing water without restriction, should confine flowing water;
- **Cross drains** - inlets cleared of all debris;
- **Sumps** - silt accumulations removed;
- **Cut and fill slopes** - maintained in a stable condition, sloughs or slumps repaired;
- **Running surface** - serviced as required, to promote early dryout and to allow optimum vehicle speed and control of surface water;
- **Stream crossings** - clear of debris and adequately protected from erosion, structurally sound;
- **Additional cross drains** - may be required where ditchline erosion occurs.

In addition, all roads, skid roads and landings should be patrolled during the spring freshet to ensure that natural drainage patterns are maintained.

Road Deactivation

When logging is completed in areas accessed by a secondary road the cost of regular maintenance becomes prohibitive. This necessitates the planning and implementation of a lower or minimal maintenance regime. A reduced maintenance regime has been referred to as deactivation, retirement or, more commonly, as "putting a road to bed".

Access management is not addressed within these guidelines and should be addressed within the normal development planning process or in a Coordinated Access Management Plan (CAMP).

Deactivation measures are aimed at minimizing erosion from road cuts, fills, surfaces and ditches in the absence of regular or on-going maintenance. To minimize erosion, essentially maintenance-free pathways on erosion-resistant materials (i.e. erosion resistant in relation to gradient) should be created for:

- all surface waters flowing in defined channels as either permanent or intermittent streams;
- all subsurface waters intercepted by road cuts;
- all over-land flow from rainfall or snowmelt on compacted and/or exposed mineral surfaces of road cutslopes, fillslopes or road surfaces.

In addition, site-specific measures may be required to reduce any physical instability of roads that may lead to future mass erosion (slides). This may require advice from Forest Service engineering staff, the Regional Pedologist or a consultant.

The extent and kind of measures taken depend on:

- how long until reactivation of the road (i.e. how long until the road will again be regularly maintained for future hauling);
- the kind of use(s) anticipated until reactivation;
- the ability (physical and tenurial) of licensees or operators to perform future maintenance;
- the specific physical and environmental setting of the road.

Four levels of deactivation are suggested to encompass the expected range of these situations; seasonal deactivation, temporary deactivation, rotation deactivation, and permanent rehabilitation.

Seasonal Deactivation

Seasonal deactivation is appropriate when a road will neither be maintained or used regularly over the coming winter, but will be maintained and used for hauling within a year or perhaps two.

Drainage structures » Ditches, settling basins, cross drains and stream crossings (culverts and bridges) should be inspected and cleaned if required.

Waterbars » Waterbars should be installed to preserve the integrity of the road surface and surfacing materials. The spacing of these waterbars needs to be sensitive to local climate, road gradient and road surface materials. Figures 8 and 9 depict waterbars on skid roads and branch roads.

Berms » Berms along the road edge should be graded-off or frequently breached and the road crowned as much as possible if this has not been done as a part of regular road maintenance.

When seasonal deactivation occurs during road construction, drainage from the unfinished roadbed should be considered. Problems are minimized when drainage structures are installed promptly after roughing-in of the subgrade, and waterbars are constructed wherever planned culverts are not yet installed.

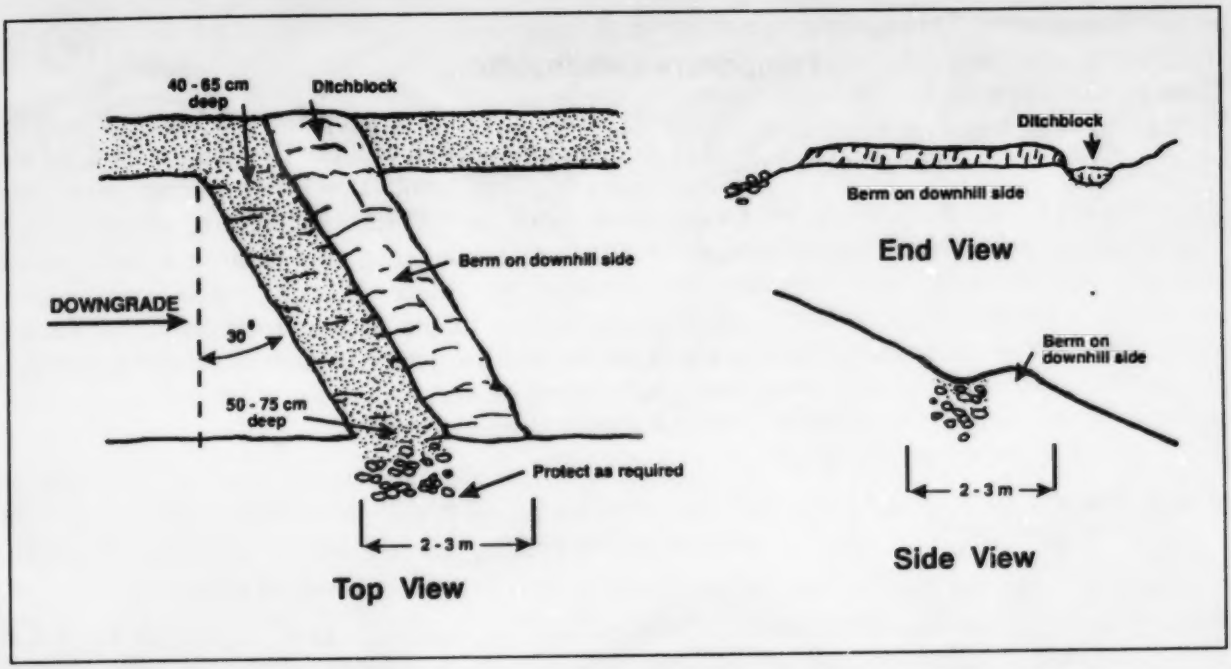


Figure 8 Waterbars on Skid Roads

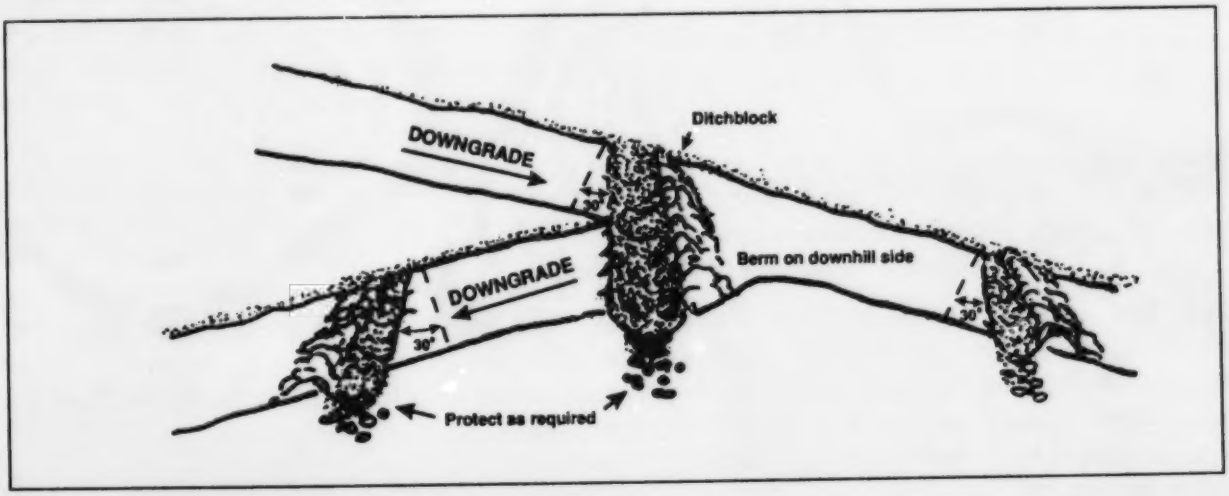


Figure 9 Waterbars on Branch Roads

Temporary Deactivation

Temporary deactivation is appropriate for branch roads as well as some mainlines that will not be used for hauling for several years (e.g. not until later in the current five year development plan or in the succeeding development plans). Future use for logging and hauling is anticipated since extensions to these branch roads can access merchantable timber in the current rotation. Other future uses include silviculture activities such as planting, surveys and stand-tending on current blocks or limited recreational activities and protection access.

Consequently, future regular maintenance is a minimum of several years away, yet preservation of the road investment as well as minimizing adverse off-site effects is desirable. Four-wheel drive pick-up access would be maintained.

Drainage structures

» Ditches, settling basins, cross drains and stream crossing (culverts and bridges) should be inspected and cleared.

Cross drain/culvert backup

» Existing cross drains (culverts) and stream culverts should be backed up by waterbars, situated a short distance down-grade, sufficient in size to handle flows if the culvert fails.

Waterbar spacing

» Waterbars ensure that if ditches and/or culverts become inoperable, water will only travel a short distance before being diverted off the road. The spacing of these waterbars needs to be sensitive to local climate, road gradient, road breaks and road surface materials. The exception to this would be on areas adjacent to long fill or sidecast slopes of all but shot-rock materials.

Outslope road surface

» The road surface should be outsloped and graded-off, or berms frequently breached. The exception to this would be on areas adjacent to long fill or sidecast slopes of all but shot rock materials.

Rotation Deactivation

Rotation deactivation is appropriate for all spurs and branch roads that will not be used for hauling for the remainder of the current rotation. Interim use of branches

for silviculture activities and limited recreational use is anticipated, as well as possible use for protection. Consequently, future regular maintenance is several decades away. Four-wheel drive pickup access on branch roads (not spurs) would be maintained.

Removal of culverts

» All culverts on spurs should be replaced with waterbars, without regard to vehicular access. Where culverts are removed from streams, the channel capacity and stability should be restored. Culverts on branch roads should be backed up with open dips or waterbars, to ensure the unimpeded flow of all surface drainage waters and to eliminate the risk of drainage waters being diverted down roads.

Replace temporary bridges

» Temporary bridges should be replaced with fords, wherever feasible.

Waterbar spacing

» Waterbars ensure that if ditches and/or culverts become inoperable, water will only travel a short distance before being diverted off the road. The spacing of these waterbars needs to be sensitive to local climate, road gradient, road breaks and road surface materials. The exception to this would be on areas adjacent to long fill or sidecast slopes of all but shot-rock materials.

Outslope road surface

» The road surface should be outsloped and graded-off or berms frequently breached. The exception to this would be on areas adjacent to long fill or sidecast slopes of all but shot rock materials.

Road surface seedbed improvement

» The road surface seedbed should be improved (e.g. shallow ripping or harrowing with a chain-drag). This creates favorable seed germination sites, reduces washing-off of seed, and improves water infiltration and thereby reduces sheet erosion. This is particularly applicable to roads that cross landscapes of high aesthetic value or visibility; and to unsurfaced roads comprised of local materials, particularly if they are medium to fine textured.

Fertilizing and seeding

» The road surface and associated denuded surfaces should be fertilized and seeded with an appropriate erosion-control mix; see the Guidelines for Areas Denuded of Vegetation as a Result of Forest Resource Management, Table 1, Appendix 3. This should be

modified in light of local conditions and local experience, or soil analysis if available. Higher seeding rates should be applied to more erosive materials. The objective should be to achieve a 70% catch of grasses within 1 year of final disturbance. Priority treatment should be given to roads passing through domestic rangeland, wildlife winter range and community watersheds.

Total Rehabilitation

Total rehabilitation of a road is appropriate where the road is redundant since alternative access has been developed or the road has been poorly located and/or constructed and either is capable of causing serious water quality problems or mass erosion. It is anticipated that total rehabilitation will not have extensive application.

The objective of total road rehabilitation is to curtail future erosion and ultimately to return the site to productive forest.

Skid Roads

The construction of skid roads may cause excessive soil disturbance resulting in surface erosion, soil compaction, slope failure, burying or removal of soil layers, exposure of subsurface soil layers, and/or impairment of the normal movement of nutrients and water. This could mean loss of site productivity and/or adverse impacts on other resource values. The productive soil land base is not renewable and the impact of a growth loss to the TSA must be minimized.

Measures should be taken to minimize or prevent excessive soil disturbance. There is rarely an opportunity to correct a problem after it has occurred. It is therefore important that the correct harvesting system and equipment is selected to minimize the number, the size and the depth of cuts on skid roads. Maximum allowable disturbance levels and

rehabilitation measures should be considered when planning the block treatment.

Construction

Location
» Preferably on benches.

Skid road spacing
» Skid roads should be a minimum of 30 m apart unless depth of excavation is less than 25 cm. (Close spacing increases the risk of slope failure, detrimental displacement, and compaction.)

Placement
» These guidelines should not preclude placing a skid road in the best possible location for minimizing any negative impacts on the environment.

Waterbar inclined roads
» Inclined skid roads should be waterbarred to divert surface runoff.

Ground skidding restrictions
» Ground skidding on saturated soils, subhygric to hydric sites, areas with frequent watercourses, and areas with high erosion or compaction hazard (e.g. lacustrine soils) should be restricted to low ground pressure machines on designated skid trails or skidding on frozen ground. If winter logged, roads, trails and streams should be marked before snowfall.

Skid roads with steep grades
» On skid roads with steep grades (i.e. greater than 20%), excavation should be kept to an minimum so that surface runoff is not channeled. Erosion hazard increases dramatically with increases in grade.

Maximum depth of cut

» The following table shows the maximum depth of excavation for skid roads on different slopes.

Table 3
Maximum Depth of Excavation on Skid Roads

Side Slope	Depth of Cut [1]
0% to 30%	25 cm [2]
31% to 50%	60 cm [3]
> 50%	25 cm [4]

Notes:

On sites with saturated soils, subhygric to hydric sites, areas with frequent watercourses, and areas with high erosion or compaction hazard (eg. lacustrine soils), the cut should not exceed 25 cm.

1 Slightly larger cuts may be necessary on broken terrain (gullies and ridges), but these areas are often more sensitive so extra care and constraint should be exercised.

2 Random skidding encouraged.

3 Depth of cut may occasionally exceed 60 cm to a maximum of 1 m.

4 Conventional ground skidding discouraged.

Skid road stream crossings

» Stream crossings should be adequate to prevent disturbance of stream channel or disruption of stream flow.

Crossings of intermittent flows

» Intermittent flow: - parallel logs with snow or dirt fill is adequate **providing that all fill material can be removed prior to spring freshet**.

Crossings of steady flows

» Steady flow or heavy intermittent flow: - metal culvert or wooden culvert with log sill abutments and log stringers.

Stabilization

Skid road stabilization

» Prior to next breakup, skid roads should be stabilized to maintain the natural drainage pattern and minimize surface runoff, including:

- removal of all crossings over natural drainage channels;

- grass seeding where a high erosion hazard exists and construction of waterbars in accordance with the following table.

Table 4
Waterbar Spacing and Seeding Requirements

Skid road Gradient	Surface Erosion Hazard[1] Low	Medium	High	Very High
	Waterbar spacing in metres			
< 5%	none	60	40	20
5-10%	60	45	30	15
10-15%	45	30	20	15
15-20%	30	20	15	10
20-30%	20	15	10	10
> 30%	15	15	10	10

Seeding Required[2]

Notes

[1] Surface erosion hazard of materials comprising >50% of the skid road, as calculated using Land Management Handbook - Developing Timber Harvesting Prescriptions to Minimize Site Degradation, T. Lewis et al., 1989

[2] The objective is to attain a 70% catch of grasses within 1 year of final disturbance.

Waterbar on steep pitches

» It is important to provide a waterbar immediately above steep pitches (greater than 20%) and below bank seepage spots.

Winter logging in sensitive areas

» Special measures should be taken on winter-logged cutblocks tributary to sensitive fish habitat or domestic water supplies where it is normally difficult to establish waterbars prior to the next breakup. Some alternatives are:

- snow skid trails;
- using a blade-mounted ripper to establish waterbars through the frost;
- constructing waterbars prior to freezing-in and filling with snow or logs that can be removed prior to breakup;
- random skidding with flex-track equipment;
- cable harvesting.

Area patrols

» The logged area should be patrolled to ensure that natural drainage patterns are maintained. This is especially important during the spring freshet, particularly in areas of sensitive fish habitat or domestic water supplies.

Rehabilitation

Occasionally it may be necessary to undertake a more complete stabilization of skid roads.

Compaction or puddling of the soils on skid roads may seriously affect the growth of future vegetation. Where this is the primary concern, the following measures should be carried out in addition to those listed under stabilization:

Decompaction of running surface

» Rip the running surface to a depth of 50-60 cm with a winged subsoiler or equivalent.

Revegetation

» Seed and fertilize the skid road as described in the revegetation guidelines on page 15 and plant with conifers, preferably species tolerant of severe soil conditions.

Seeding performance

» Monitor seeding performance and refertilize as needed.

Where aesthetics may be a primary concern:

Replacement of sidecast material

» Replace the sidecast soil and debris back onto the skid road to reestablish the original slope profile.

Grass seeding

» Grass seed the disturbed soil with an erosion control seed mix.

Planting

» Plant with trees.

Landings

Research indicates that the productivity of most landing sites in the interior is severely degraded. Generally, most landings will not produce a commercial crop of trees during the next rotation unless fully rehabilitated. This is a major concern since landings occupy 3 to 5% of logged over areas, often on the best sites.

Productivity is degraded primarily from displacement of the nutrient-rich upper soil layers and from compaction. Compaction adversely affects tree root growth, infiltration and the moisture holding capacity of the soil. Compaction usually extends from the surface to a depth ranging from 40 to 80 cm, depending on soil type and machine activity.

For rehabilitation to be effective, nutrients must be restored to the site (e.g. by respreading topsoil) and compacted soils must be loosened to an adequate depth.

Since the logistics and value of total landing rehabilitation have not been fully resolved, staff of each Forest District will use their own discretion to implement a landing construction and rehabilitation program on a trial basis. This specifically pertains to the piling and respreading of the upper soil layers and the depth to which decompaction (ripping) is carried out.

Area in landings

» The amount of area disturbed for landings should be less than 4% of the cut area. Where cutblocks are smaller than 8 ha, landing size should be limited to 0.3 ha.

Landing size

» Landings should be kept as small as practical. On steeper slopes, larger landings increase the risk of surface erosion and slope failure.

Location

Existing landings

» Existing landings should be utilized wherever feasible, and new landings should be located to access as many future cutblocks as possible.

Landing location and debris

» All landings and landing debris should be kept a minimum of 40 m from all:

- swamps and water courses;
- designated immature timber which is reserved from cutting (with the exception of selection logging);
- cutblock edges (except where a road forms the boundary or the landing will be used for the adjacent stand. In such situations the buffer may be reduced to 20 m if slash disposal will not result in damage to fringe timber).

Landing location in sensitive areas

» Where feasible, all landings and landing debris should be kept at least 100 m from:

- fish-bearing streams;
- permanently flowing streams having domestic water licences.

Landings near lakeshores

» Landings should be at least 200 m from lakeshores where alternatives exist.

Placement

» These guidelines should not preclude placing a landing in the best possible location for minimizing any negative impacts on the environment. A small bench closer to a creek may be preferable to heavy excavation on a sidehill further away.

Closer placement

» When landings are located as close or closer than the above specified distances, it is important that no slash or debris is pushed closer. This will require extra supervision.

Construction

Soil reserved

» The upper layers of soil should be piled on the landing and made accessible for respreading. Most of the nutrient capital of a soil is concentrated in the upper 25 cm of soil. All of the upper organic layers (duff) and as much of the underlying 25 cm of soil as is practical should be saved.

Exceptions to reserving soil

» Exceptions to this are:

- rocky conditions which preclude topsoil removal;
- steeper slopes (more than 15%) where operational problems or the larger landing size needed to store topsoil do not justify the benefits;
- poor and low sites;
- if landings are less than .1 ha and less than 1% of the block area;
- on selection and other partial cuts where landing(s) will be used for additional logging entries;
- wet sites where the landing soils are continuously saturated throughout the year.

Cull pile

» A concentrated cull pile for all combustible debris should be designated within the confines of the landing and should be accessible for respreading after burning. In order to minimize landing size on steep slopes, it may be preferable to locate the cull pile on the fill slope, thus precluding respreading. The combustible debris should be piled at least 5 m from adjacent slash and be surrounded by a mineral soil fire guard, except on sites to be broadcast burned.

Stump disposal

» Stumps may be disposed of by:

- piling stumps with the topsoil for respreading after burning. The stumps will replenish some organic matter as they decompose, provide shade for seedlings and discourage vehicle traffic on the landing. This is the preferred method.
- moving stumps with as little soil as possible and scattering around the periphery of the landing.
- separating stumps from the soil and piling with the other combustible debris for burning. It is important not to mix soil in with the debris pile, as this often leads to hangover fires.
- completely burying stumps under a minimum of 1 m of soil (except stumps with root rot). It is important that stumps are not partially exposed as they could catch fire during debris disposal and lead to underground fires.

Drainage from landings

» Landings should be constructed with adequate drainage located to prevent runoff from flowing onto the landing.

Rehabilitation

Debris disposal

» Debris should be sufficiently burned so that it does not interfere with reforestation and meets hazard abatement requirements.

Spread debris piles

» Concentrated ashes from debris piles are too alkaline for establishment of most trees. They should be spread out over the landing where they may enhance seedling growth by contributing nutrients.

Prior to breakup

» Prior to the next breakup, measures should be taken to prevent landing erosion including:

- grass seeding to achieve 70% cover within one year of final disturbance (for winter logging, seeding may be postponed as long as 70% cover is achieved by the second breakup following harvest);
- establishing sufficient drainage to prevent ponding;
- providing cross drainage to prevent water from flowing onto the landing.

Winter logging on sensitive sites

» Special measures should be taken where it is not possible to establish cross drains prior to the next breakup on winter-logged cutblocks tributary to sensitive fish habitat or domestic water supplies. Landings should be constructed to ensure the feasibility of drainage restoration on frozen ground (e.g. fill cross drains with logs or snow prior to freezing-in).

Area patrols

» Landings (along with roads and skid roads) should be patrolled to ensure that natural drainage patterns are maintained. This is important during the spring freshet, particularly in areas of sensitive fish habitat or domestic water supplies.

Full Rehabilitation

Respread topsoil » Topsoil and the remains of the debris pile should be respread over the landing if it will not be used again before the next rotation. Respreading should follow as soon as possible after logging or site preparation.

Deep ripping » Where the landing will not be used again before the next rotation, it should be ripped to a depth of 40 to 80 cm depending on the depth of compaction. Ripping should result in at least 70% shatter of the soil profile above the specified depth.

Ripping timing » Ripping should follow as soon as possible after logging or site preparation, and should be carried out in 2 directions at right angles to each other. The soil should be dry enough (less than 25% moisture content) to achieve adequate fragmentation.

Partial Rehabilitation

Shallow ripping, seeding landing » Where it is not feasible to save the topsoil, or it is not required, the remains of the debris pile should be spread out and the landing should be shallow ripped to at least 20 cm depth, fertilized and seeded with a mix containing a high legume content.

Fireguards

The construction of fireguards may also cause excessive soil disturbance. Although fireguards can normally be rehabilitated with grass or tree seedlings due to limited soil compaction, there can be significant site productivity losses and negative impact on down stream resources if water flows are altered or interrupted.

Fireguard limits » Fireguards should be limited to one trail around the periphery of the cutblock.

Fireguard width » Width should not exceed 5 metres

Fireguard depth of cut

» Depth of cut should not exceed 25 cm.

Alternate guarding methods

» Where a 5 metre wide guard is not considered sufficient to stop a running fire, consideration should be given to an alternate guarding method (see below) or a preliminary burn-off along the inside of the guard, rather than widening the cat trail itself.

Construct down hill

» Normally crawler tractors constructing fireguards work progressively down hill. If a slope is too steep or soil conditions too moist for a machine to back up hill while working, an alternate system for guard construction should be used.

Interrupting natural stream courses

» Fireguards should not interrupt or rechannel natural stream courses. All water courses must be left open.

Fireguard construction

» Fireguards should be constructed to exclude vehicular traffic. The operation of any vehicles on fireguards should be discouraged, in order to reduce site productivity loss due to compaction.

Fireguard rehabilitation

» Fireguards should be stabilized and rehabilitated to the same standards as required on skid roads (see page 42 and 44).

Alternate fireguarding methods

» Where possible, the following alternate guarding methods should be used to minimize the loss of site productivity:

- natural breaks such as roads, rock, etc.;
- fire retardant guards;
- hose lay and sprinkler systems;
- no guards on late burns;
- preliminary burn-off along narrow constructed trail;
- use of top skid trail as fireguard, no logging above this trail or use of hoe to pull debris off area above trail;
- hoe on snow pack;
- hand constructed fire guard.

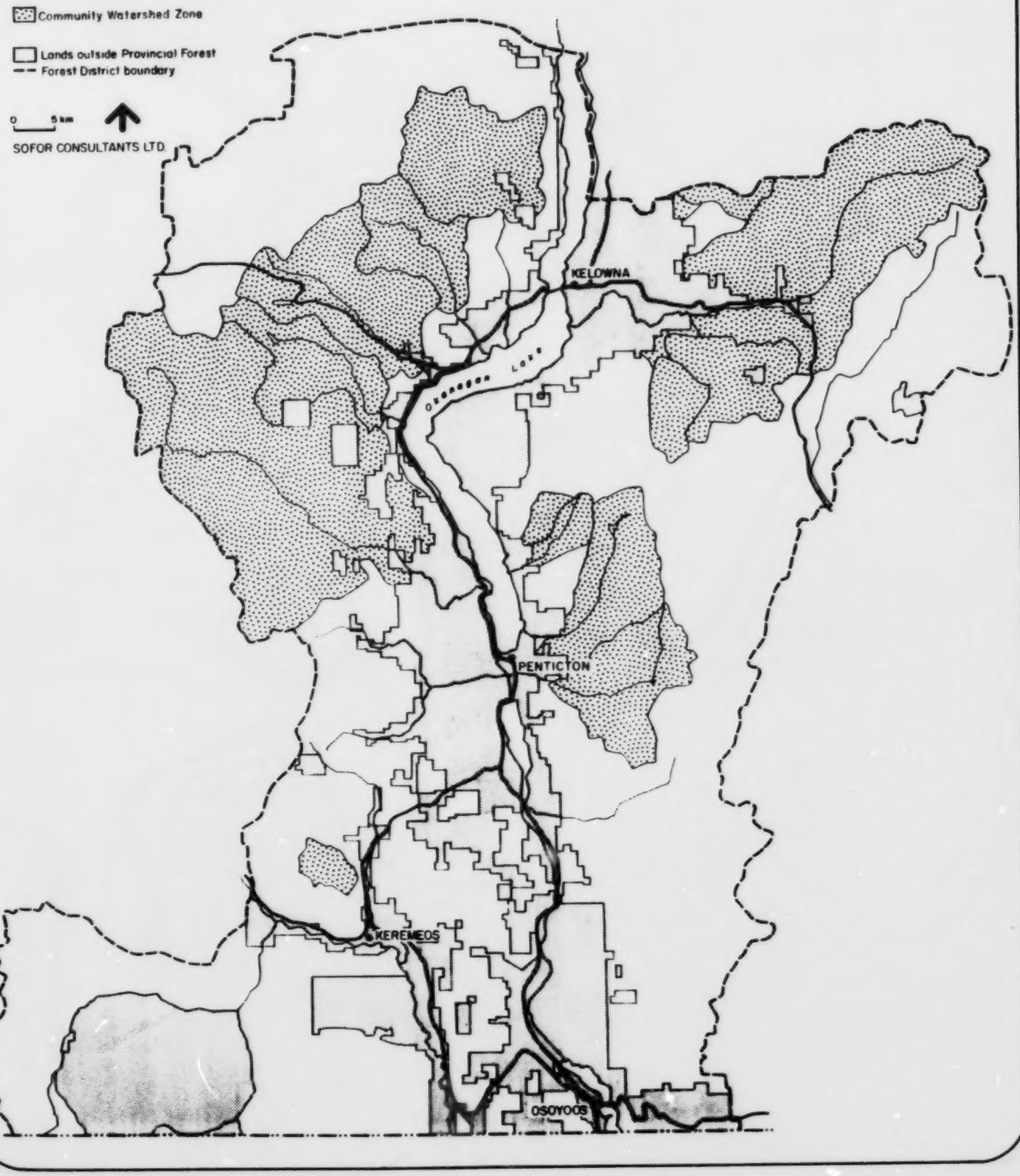
When to use alternatives

» These alternate methods are most desirable on steeper slopes, and particularly slopes over 50% where cat work is most destructive.

Community Watershed Zone

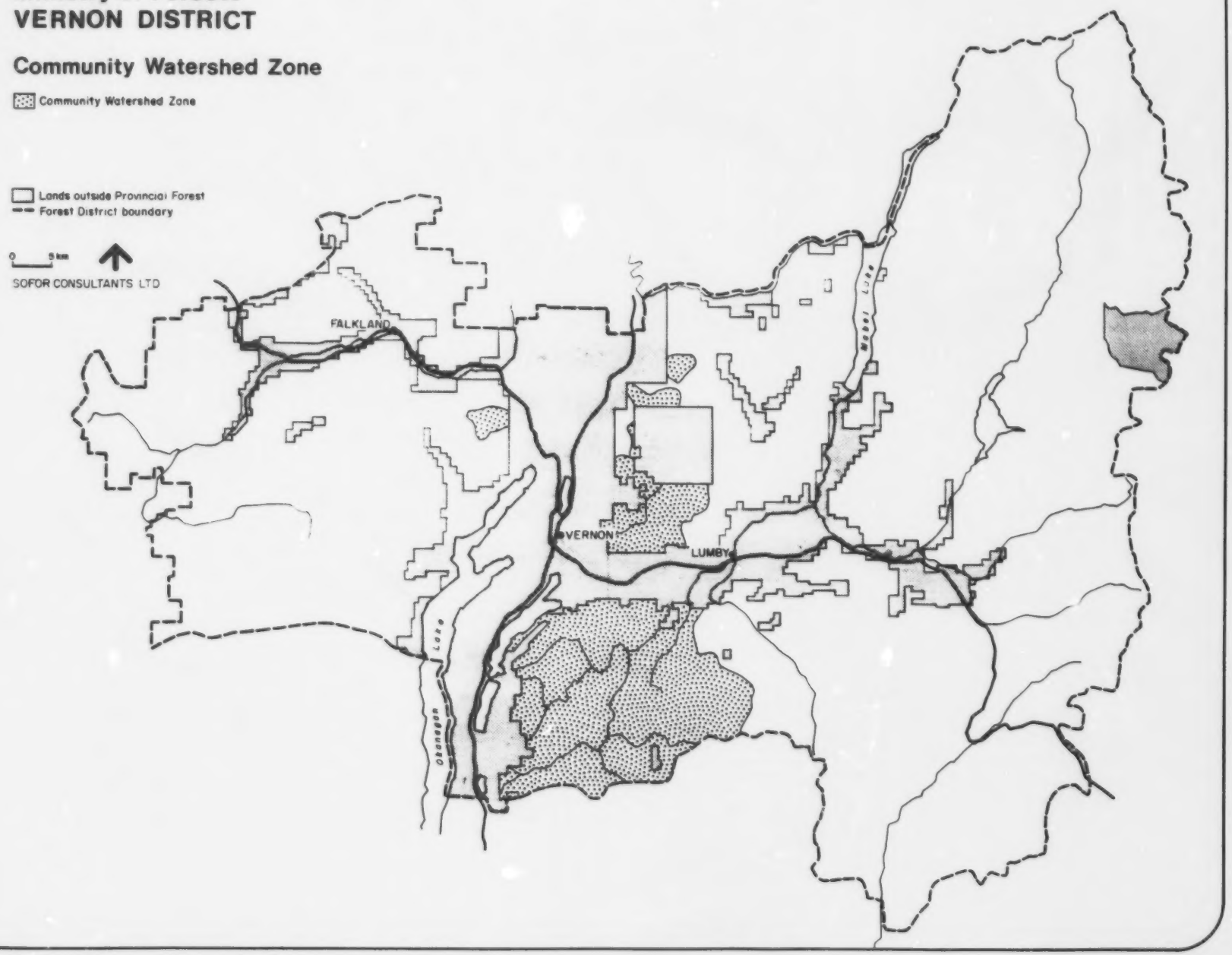
Ministry of Forests
PENTICTON DISTRICT

Community Watershed Zone



Ministry of Forests
VERNON DISTRICT

Community Watershed Zone



Ministry of Forests
SALMON ARM DISTRICT

Community Watershed Zone

Community Watershed Zone

Lands outside Provincial Forest
Forest District boundary

0 5km

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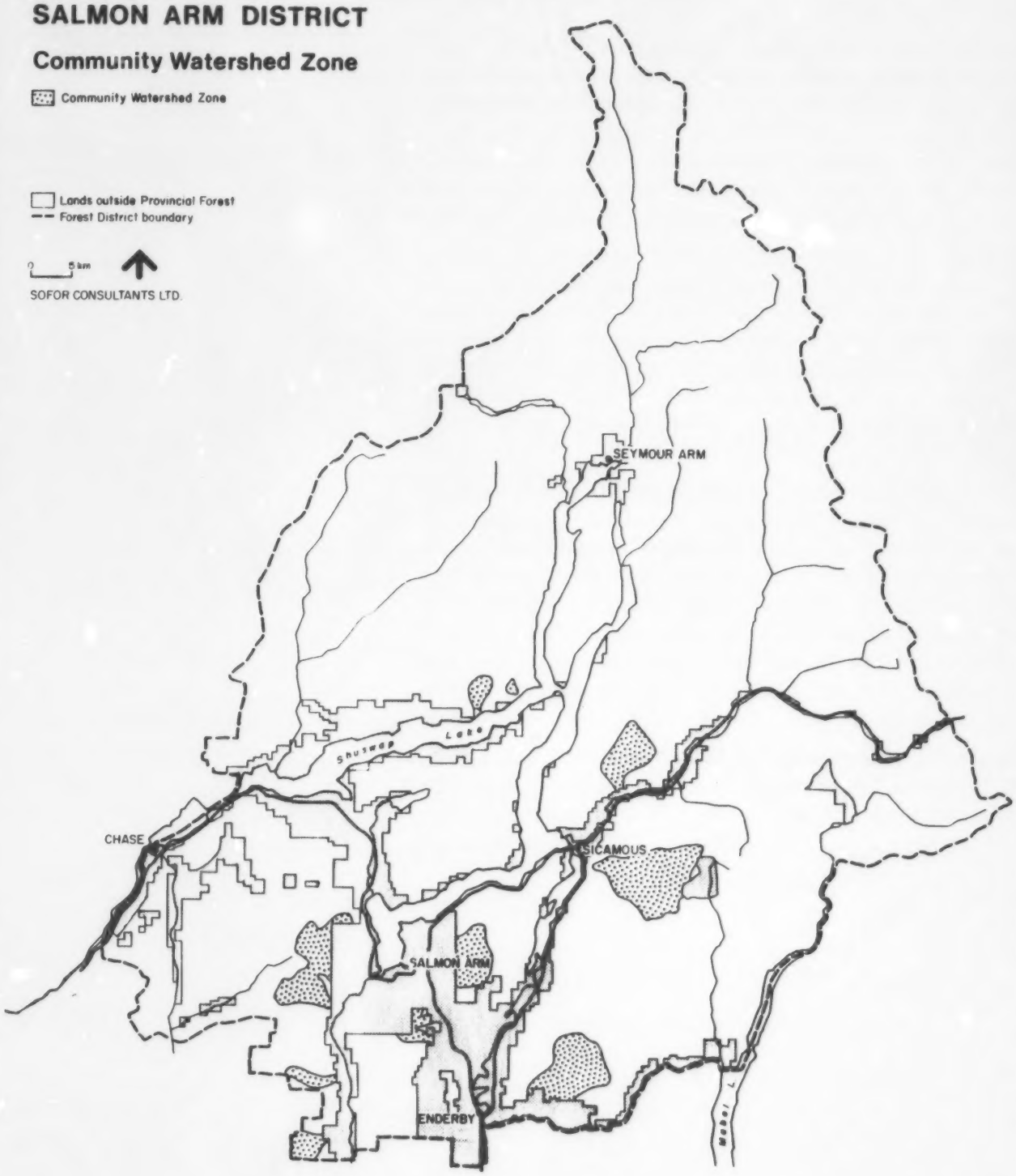


Community Watershed Zone

The Basic Integrated Resource Management Guidelines for All Zones apply unless more stringent guidelines are noted for this Zone. These guidelines supersede "Guidelines for Watershed Management of Crown Lands Used as Community Water Supplies" (1980), however, they are only considered to apply to the portion of the watershed above the lowest water intake.

In the Community Watershed Zone the priority consideration is the maintenance of the water resource. When conducted, timber management activities should provide for the maintenance of water quality, water quantity and timing of runoff. Compared to other watersheds, the rate of cut should be slower, cutblocks should be narrower to maximize shading, and they should be smaller.

More emphasis should be placed on silvicultural systems that maintain continuous forest cover and clearcutting should be designed to create a mosaic of tree species and age classes. Road right-of-ways and road surfaces should be narrower where quality can be maintained. Soil disturbance from harvesting activities should be much less and more emphasis should be placed on decompaction and/or revegetation of exposed soil that may be prone to erosion.

In short, all activities should be conducted to the highest standards practical, considering that water is one of the most valuable resources we have in the Okanagan/ Shuswap and British Columbia.

Harvesting

The requirements for riparian areas are especially important for all Community Watersheds. Refer to pages 16 to 21 for detailed guidelines.

Clearcut Logging

Prior to harvesting in a Community Watershed, a "total chance" development plan should be completed and submitted.

Winter logging

» Where alternatives exist, logging during the snow-free period is preferred. Operations that may cause siltation of streams (skidding, loading, hauling, road construction, etc.) should be terminated before break-up or during significant rainfall.

Cutblock size

» Maximum cutblock size is 20 ha, including contour cutblocks. Standard reserve widths apply as detailed in the Basic Guidelines (pages 10 and 14).

Maximum harvest within watersheds

» The maximum level of harvest is 20% of the forested area, expressed as Equivalent Clearcut Area. Refer to the explanation in the Basic Guidelines, page 12.

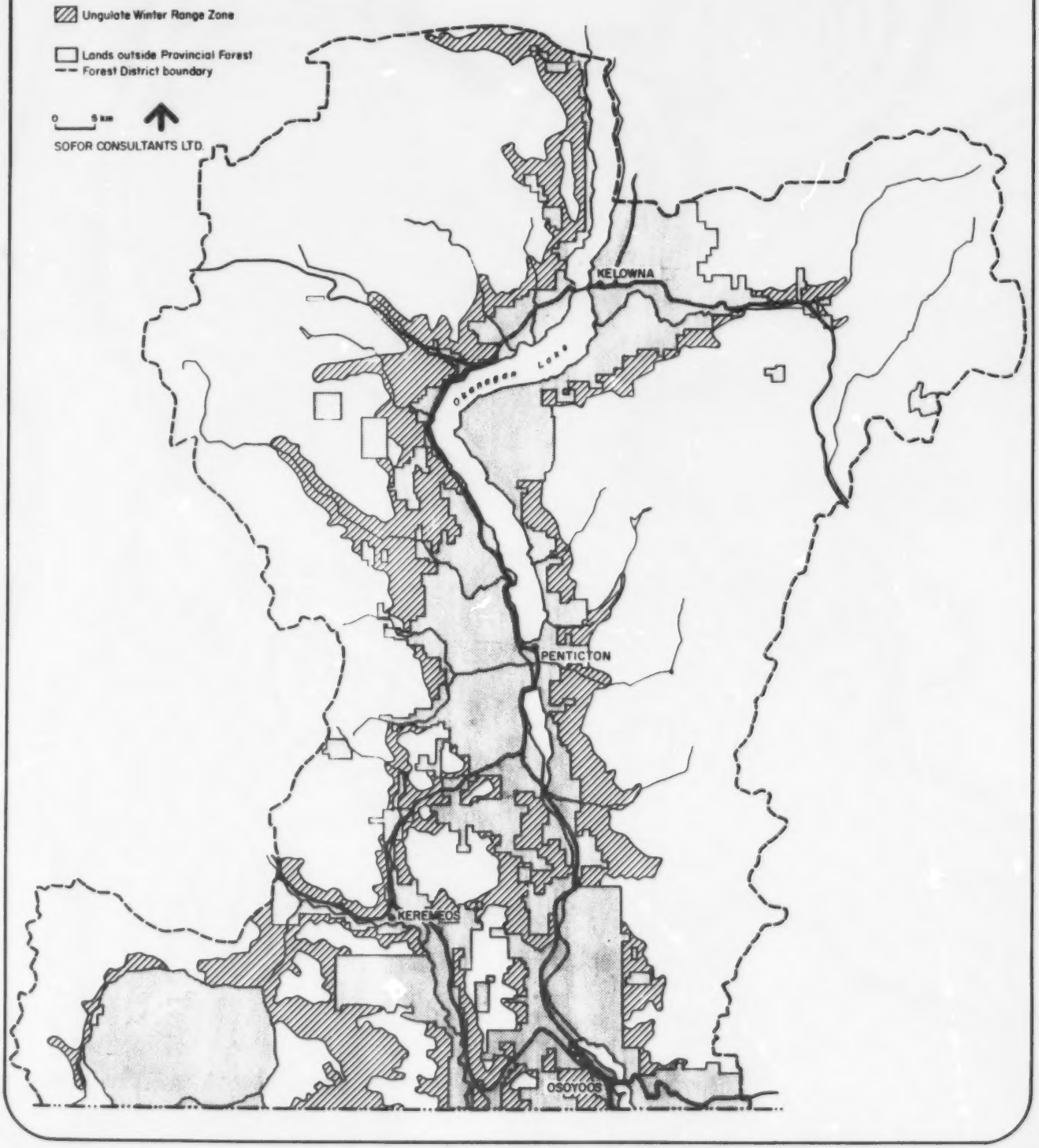
Exceeding 20% limit

» For proposals exceeding the 20% limit, supporting hydrological data must be provided.

Ungulate Winter Range Zone
(Deer, Sheep and Elk)

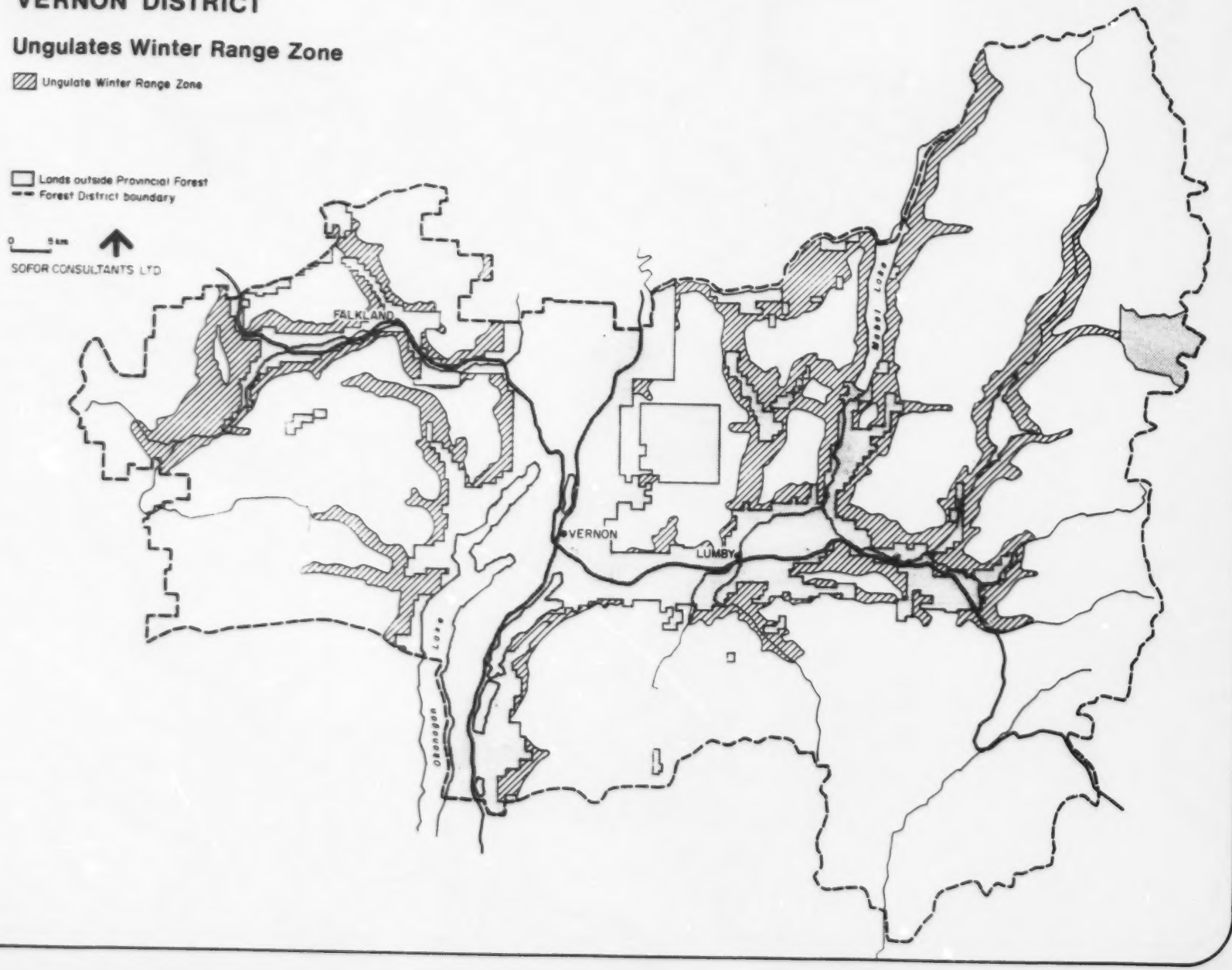
Ministry of Forests
PENTICTON DISTRICT

Ungulates Winter Range Zone



Ministry of Forests
VERNON DISTRICT

Ungulates Winter Range Zone



Ministry of Forests
SALMON ARM DISTRICT

Ungulates Winter Range Zone

Ungulate Winter Range Zone

Lands outside Provincial Forest
Forest District boundary

0 5km

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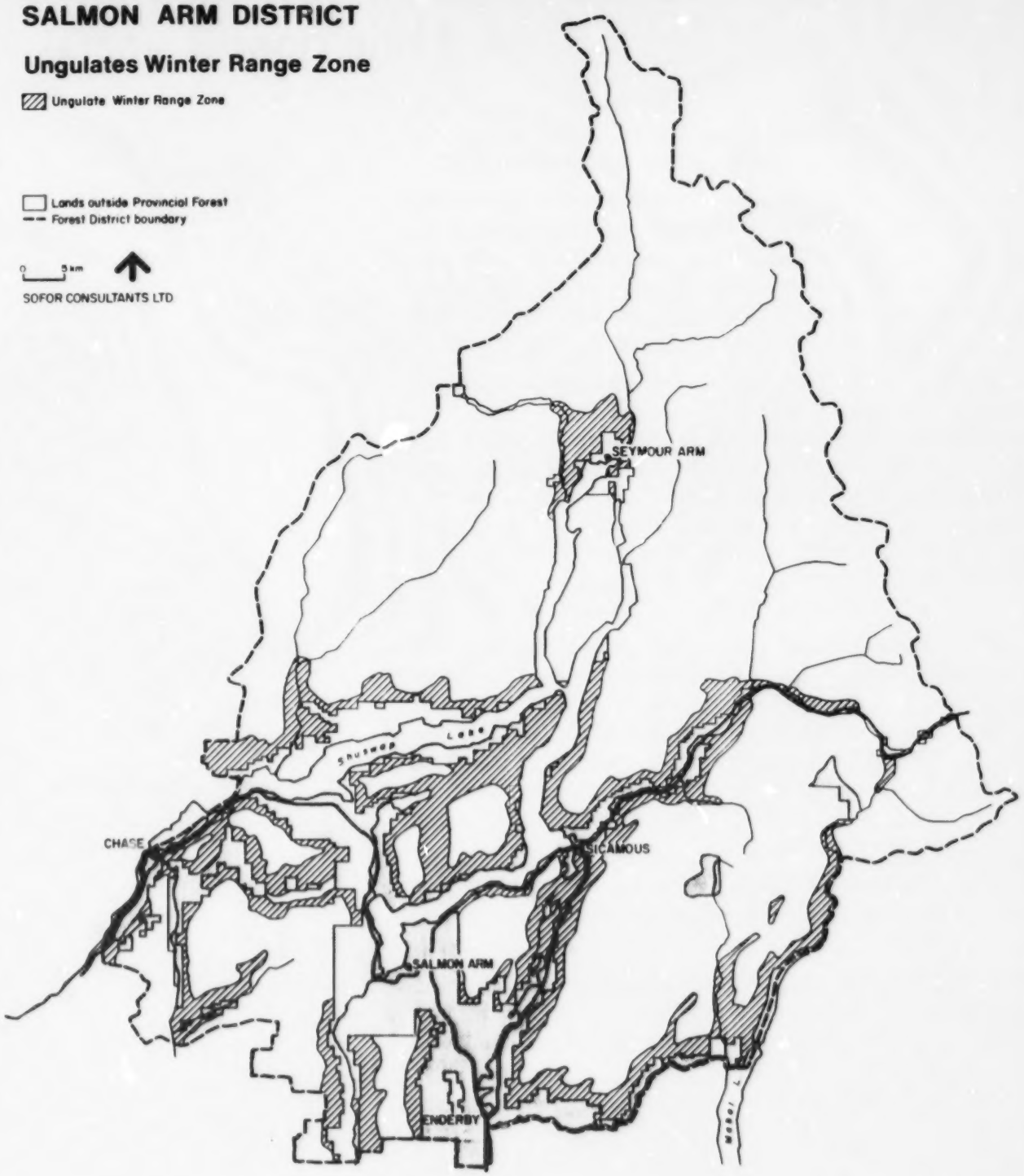


Ungulate Winter Range Zone (Deer, Sheep and Elk)

The Basic Integrated Resource Management Guidelines for All Zones apply unless more stringent guidelines are noted for this Zone.

The dominant consideration in the Ungulate Winter Range Zone is the maintenance of the winter range resource for ungulates. The intent is to maintain or enhance forage production by dispersing the harvest throughout the winter range and by spreading it out evenly over the rotation in as many passes as possible.

Ungulate winter range areas are identified on the Canada Land Inventory (CLI) maps for Wildlife Ungulates and are typically CLI Classes 1W, 2W, 3W and 2W-3W. Significant portions of these units are open range and rock, and portions of the forested range are non-winter range areas that are impractical to delineate at this level of mapping. Other winter range areas will be identified as habitat inventory is upgraded. Field inspections to clearly define the winter range may be required.

The winter range guidelines apply to approximately 50,000 ha of productive forest land or 2.2% of the entire Okanagan TSA. Over 75% of the winter range zone is in types where selection logging is a viable option. Some winter ranges, particularly in the northern portions of the TSA, may require stricter guidelines to reduce the adverse impact of greater snow accumulation.

The Ungulate Winter Range Zone pertains to deer, sheep and elk only. Moose winter range requirements should normally be accommodated by the Basic Guidelines for All Zones.

The requirements for other wildlife species such as caribou and grizzly bear will be addressed within Local Resource Use Plans and development plans.

Harvesting

Clearcut Logging

Cutblock boundaries

» It is desirable for wildlife that the cutblock boundaries be irregular to maximize the ecotone area.

Cutblock size

» Clearcuts should be varied in size with a 5 ha maximum size and a minimum 300 m reserve width. Standard greenup requirements may be reduced to maintain forage production within cutblocks.

Thermal cover units

» 40% of the identified winter range should be retained in stands (thermal cover units) of minimum height class 3 (20-30m) with an average conifer thermal canopy greater than 70%. Conifer thermal canopy is the amount of overhead cover occupied by the crowns of trees greater than 3 m in height.

Thermal cover unit size

» Thermal cover units should be at least 10 ha in size. These units should be linked together by suitable travel corridors.

Thermal cover retention in PPZ

» In the Ponderosa Pine Biogeoclimatic Zone, 20% of the identified winter range subzone should be retained as thermal cover. Thermal cover areas should be no less than 1 ha in this biogeoclimatic zone.

Selection Logging

Selection cuts

» Selection cuts on winter range should follow the process as identified in Appendix 5.

Timing of re-entry

» Selection cuts should be designed to permit a re-entry logging pass every 20 to 30 years.

Lakeshore Zone

Lakeshore Zone

The Basic Integrated Resource Management Guidelines for All Zones apply unless more stringent guidelines are noted for this Zone. The Lakeshore Zone applies to the upland lakes within the Okanagan TSA. The large lowland lakes are outside the scope of these guidelines.

The Lakeshore Zone is the forested area within 200 metres of the riparian area surrounding category "A", "B", and "C" lakes (see definition of lakeshore in glossary). The 200 metre area may be further extended where needed to maintain values on specific lakes. Appendix 6 shows a list of "A", "B", and "C" lakes in each Forest District.

Upland lakes are an integral part of the social and economic framework of the Okanagan TSA. They are focal points for a wide variety of recreational activities and are perhaps the most important recreational features in the forest land base. In addition, the lake and adjacent riparian areas are important to fish, wildlife and plant species, often containing the greatest biological diversity within our forests. Carefully planned harvesting of timber within most lakeshore zones can be designed to simulate the natural processes of forest replacement following maturity and decline.

Logging patterns have already been established along many lakes, thus placing greater pressures on the remaining lakes to provide certain types of recreational experiences. This may include a limited number of "walk-in" lakes and/or "protected" lakes. Logging may be compatible with walk-in lakes; however, since an old growth, forested lakeshore is almost impossible to replace, some lakeshore zones have been designated for preservation. Preservation lakeshore zones and walk-in lakes are noted in Appendix 6. A lake management plan should be completed before logging takes place within 2 km of any walk-in lake or protected lake. This plan would be prepared by staff from the Ministry of Environment, the Forest Service, and affected resource users. Additions to the list of lakes requiring lake management plans will be made as the need arises.

Harvesting within the majority of lakeshore zones can be compatible with other resource values. However, the type and amount of harvesting needs to vary according to the qualities of each lake. Consequently, the guidelines developed for each category of lake take into consideration such things as degree of use, angler effort, productivity, recreational value, aesthetic value and hydrological importance. Category A lakes are recognized as having the highest values while C have the lowest.

Partial cutting methods such as selection and group selection are encouraged in most lakeshore zones. This will permit a long term yield of timber for harvesting, while maintaining some tall timber for shelter, aesthetics and wind protection.

The lakeshore zone guidelines must be applied with sound judgement recognizing the specific nature of each lake as well as the specific terrain and surrounding forest values. Modifications to the guidelines must recognize that lakes are sensitive to disturbances and have a high public profile.

A landscape inventory should be completed for those lakes identified in Appendix 6 before submission of a Pre-Harvest Prescription within the area visible from the lake and the surrounding Lakeshore Zone.

Harvesting

General

In addition to the Basic Integrated Resource Management Guidelines (note especially the Riparian Areas section), the following guidelines apply to all lakeshore zones.

Harvest method preference

» Selection logging is preferred to clearcut logging.

Retention of brush and cover

» Deciduous cover and brush should be retained particularly along shorelines where they have a positive influence on the landscape.

Vegetative diversity » Vegetative diversity should be encouraged. For example, where little or no deciduous cover remains along the lakeshore following logging, consideration should be given to planting native deciduous species to reduce the visual impact.

Reforestation priority » The Lakeshore Zone should be considered as a priority area for reforestation.

Opening shapes » The shape of openings should follow natural boundaries (e.g. ridge lines, gullies, timber types, rock outcrops).

Random skidding » Random skidding is preferred to defined trails.

Removal of slash » Thorough disposal or removal of right-of-way slash should occur along all roads which will remain open to public use following logging.

Landings » Landings that significantly detract from the landscape values should be fully rehabilitated and recontoured to fit in with the surrounding topography.

Grass seeding » Roads, landings, skid trails and areas of significant ground disturbance should be grass seeded promptly.

Residual trees » Residual trees should only be retained where they are windfirm and of sufficient density and composition to have a positive aesthetic influence.

Main haul road location » Where alternatives exist, main haul roads should not be within 200 m of the lakeshore.

Replacement of sidecast material » Where aesthetics values may be compromised or there is insufficient distance between the skid roads and the lake to ensure the effectiveness of waterbars, replace sidecast soil and debris to its original position on the slope with a backhoe or excavator.

"A" Lakes Subzone

Harvesting

These harvesting guidelines are in addition to the guidelines outlined on pages 56 to 57.

General

Clearcut logging is not permitted within the A Lakes Subzone.

Selection Logging

Amount of lakeshore cut
» A maximum of 25% of the lakeshore may be cut during each pass. A higher percentage may be acceptable if significantly more than 50% of the undisturbed crown closure is retained.

Minimum crown closure
» A minimum of 50% of the undisturbed crown closure should be retained.

Windfall risk situations
» Preparatory cuts as low as 10% of the stand basal area may be required in moderate to high windfall risk situations.

Harvest of adjacent stands
» Harvesting of adjacent stands should wait until wind firmness is confirmed on previously harvested areas (8-15 years).

Roads, Landings and Skid Roads

Spur road and landing location » Spur roads and landings should be at least 200 m from the lakeshore.

Skid road location » Skid roads should be at least 40 m from the lakeshore.

Skid road construction » Skid roads with greater than 25 cm cuts should be at least 200 m from the lakeshore unless a satisfactory rehabilitation plan is submitted (see page 44).

"B" Lakes Subzone

Harvesting

These harvesting guidelines are in addition to the guidelines outlined on pages 56 to 57.

General

Both clearcut and selection logging are permitted, however, selection logging is preferred.

Amount of lakeshore cut » Selection and clearcut logging should not collectively exceed 33% of the lakeshore during each pass.

Timing of harvest of adjacent stands » Harvesting of adjacent stands should wait until greenup and windfirmness are achieved on initial cut-over areas.

Clearcut Logging

Amount of lakeshore cut
» Up to 10% of the lakeshore may be in a non-greened-up state.

Cutblock length
» Cutblocks may be a maximum 300 m wide along the lakeshore.

Selection Logging

Amount of lakeshore cut
» A maximum of 33% of the lakeshore may be cut during each pass. A higher percentage may be acceptable if significantly more than 50% of the undisturbed crown closure is retained.

Minimum crown closure
» A minimum of 50% of the undisturbed crown closure should be retained.

Windfall risk situations
» Preparatory cuts as low as 10% of the stand basal area may be required in moderate to high windfall risk situations.

Harvest of adjacent stands
» Harvesting of adjacent stands should wait until wind firmness is confirmed on previously harvested areas (8-15 years).

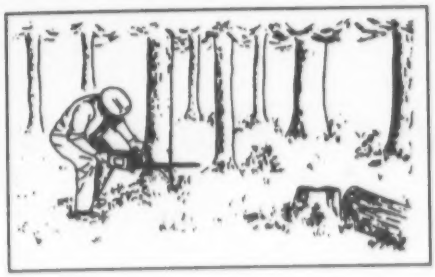
Roads, Landings and Skid Roads

Spur roads and landings
» Spur roads and landings should be at least 200 m from the lakeshore.

Skid road location
» Skid roads should be at least 40 m from the lakeshore.

Skid road construction
» Skid roads with greater than 25 cm cuts should be at least 200 m from the lakeshore unless a satisfactory rehabilitation plan is submitted (see page 44).

"C" Lakes Subzone



Harvesting

These harvesting guidelines are in addition to the guidelines outlined on pages 56 to 57.

General

Both clearcut and selection logging are permitted, however, selection logging is preferred.

Timing of harvest of adjacent stands
» Harvesting of adjacent stands should wait until greenup and windfirmness are achieved on initial cut-over areas.

Clearcut Logging

Amount of lakeshore cut
» Up to 25% of the lakeshore may be in a non-greened-up state.

Cutblock width
» Cutblocks may be a maximum 400 m wide along the lakeshore.

Selection Logging

Amount of lakeshore cut
» There is no restriction on the amount of lakeshore that may be cut.

Windfall risk situations
» Preparatory cuts as low as 10% of the stand basal area may be required in moderate to high windfall risk situations.

Roads, Landings and Skid Roads

Spur roads and landings

» Spur roads and landings should be at least 200 m from the lakeshore.

Skid road location

» Skid roads should be at least 20 m from the lakeshore.

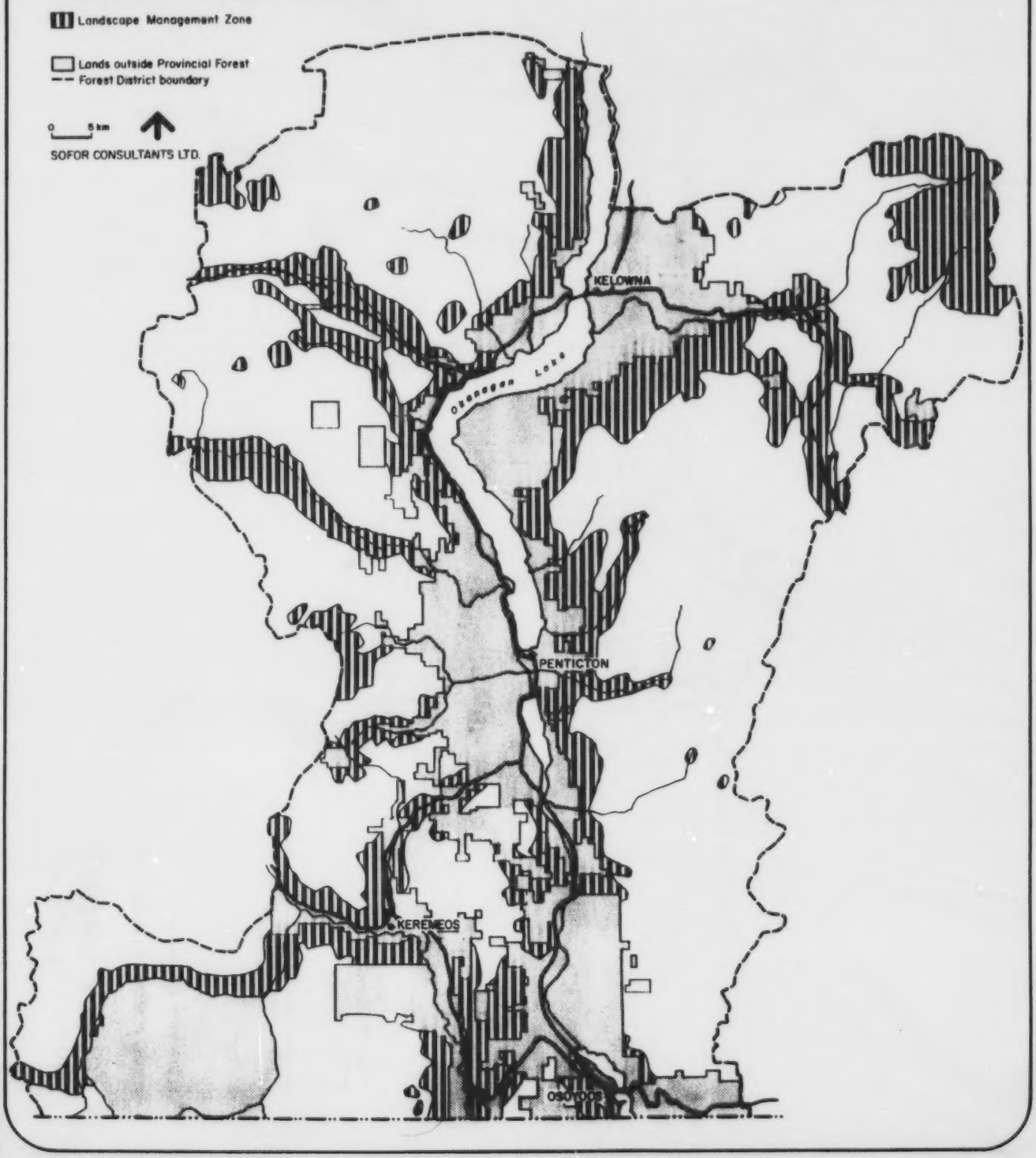
Skid road construction

» Skid roads with greater than 25 cm cuts should be at least 100 m from the lakeshore unless a satisfactory rehabilitation plan is submitted (see page 44).

Landscape Management Zone

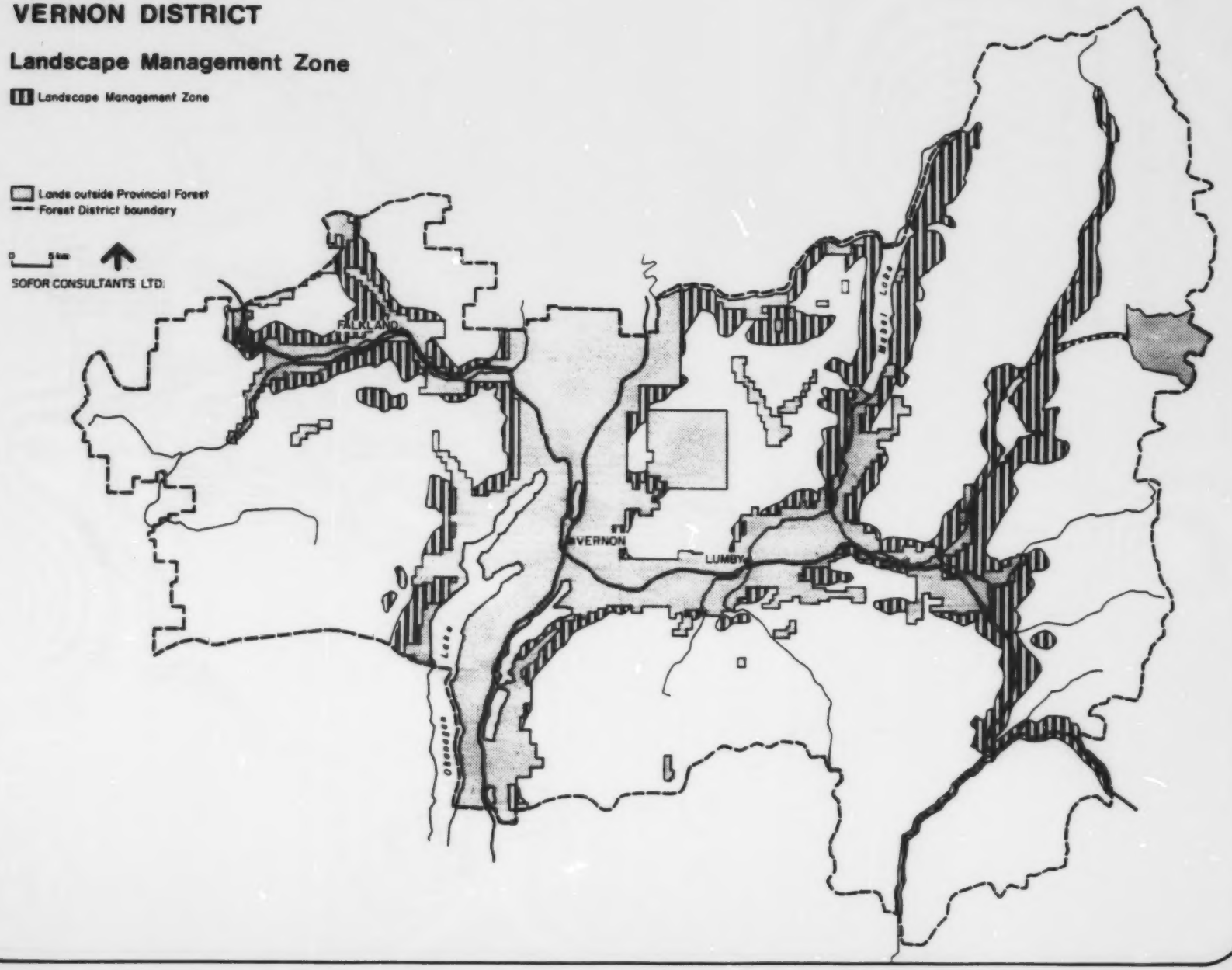
Ministry of Forests
PENTICTON DISTRICT

Landscape Management Zone



Ministry of Forests
VERNON DISTRICT

Landscape Management Zone



Ministry of Forests
SALMON ARM DISTRICT

Landscape Management Zone

Landscape Management Zone

Lands outside Provincial Forest
Forest District boundary

0 5 km

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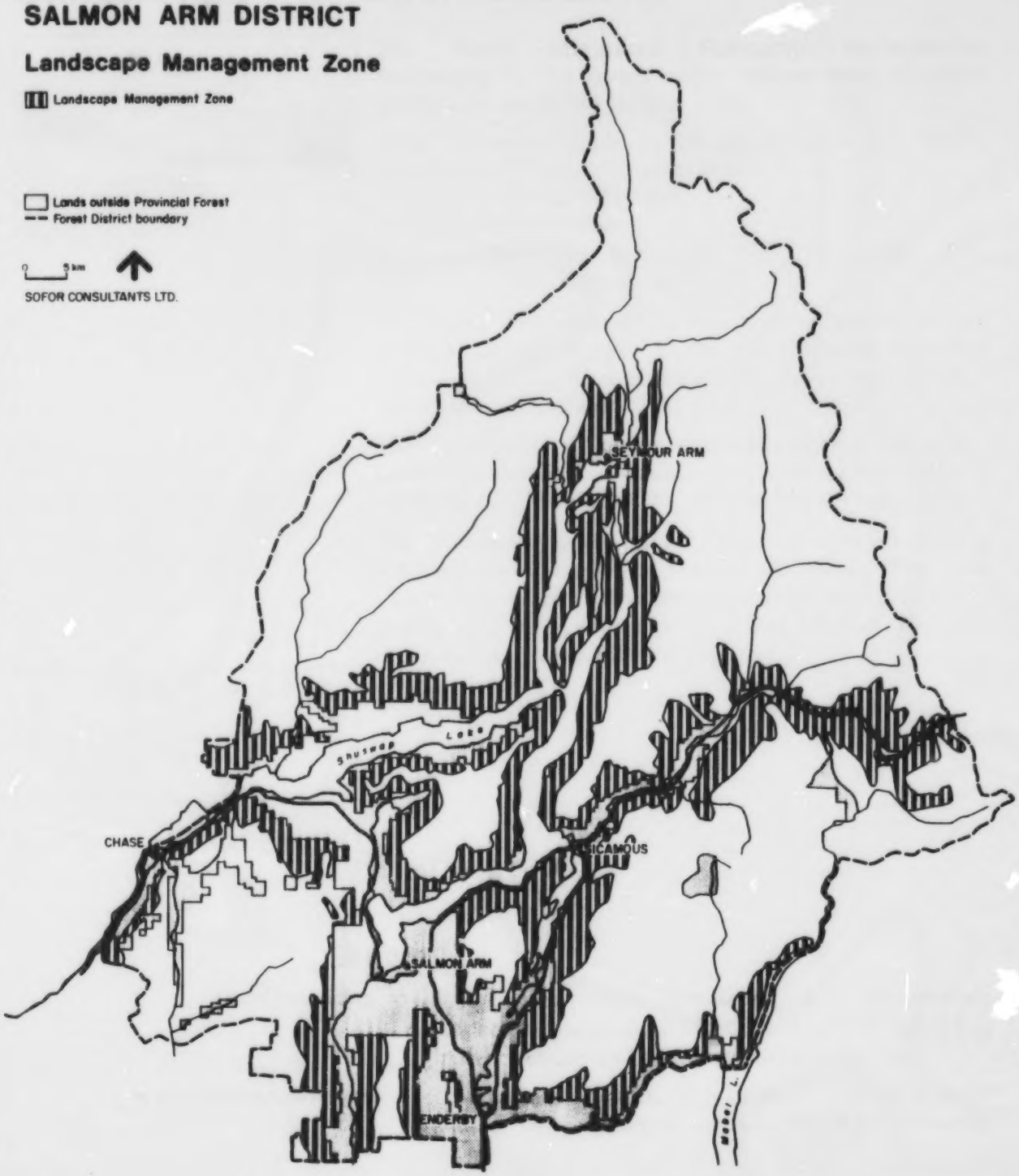


Landscape Management Zone

The Basic Integrated Resource Management Guidelines for All Zones apply unless more stringent guidelines are noted for this Zone.

These guidelines apply to areas within the TSA which include visually sensitive areas as seen from:

- Major travel routes;
- Communities;
- Recreation use areas (parks, recreation sites, fishing camps, trails, etc.).

The extent and intensity to which these guidelines are followed relates directly to the visual quality objective identified; i.e. the level of impact which is acceptable on a particular visible slope.

These guidelines are meant to provide general direction - further information is available in the Ministry's FOREST LANDSCAPE HANDBOOK and from district staff.

The Landscape Management Zone is divided into 4 subzones based on Visual Quality Objectives. The more visual impact forest management activities have on an area visible from travel routes, communities and recreation use areas, the more restrictive the objective.

Harvesting

General

Visual simulation

» Visual perspective simulation and appropriate landscape design should be carried out for harvesting in the retention and partial retention subzones.

Alternate yarding systems

» Low ground pressure, cable or aerial yarding systems should be considered for use on steep, visually

sensitive sites where the risk of extensive site disturbance is high.

Selection and other partial cutting systems that retain a substantial amount of the original forest cover may reduce the visual impact of harvesting activities. Where feasible, these systems are preferred over clearcutting.

Residuals » Healthy, undamaged conifers and deciduous trees left in clumps or in sufficient densities can help reduce colour, texture and line contrasts. Damaged, leaning and spindly residual trees should be downed, particularly in foreground views.

Slash » Accumulations of slash, especially in foreground views, should be avoided.

Clearcut Logging

Cutblock distribution » Cutblocks should be distributed between visible and non-visible areas and between steeper and gentler slopes, and different forest types within visible areas.

Cutblock size » Size should be based on naturally occurring openings in the surrounding areas.

Cutblock shape » Cutblocks should be designed to follow natural lines and forms such as ridgelines, creek draws, rock outcrops, timber types, etc.

Cutblock edge » Edges of cutblocks should be "feathered", where possible, similar to the edges of natural openings by increasing tree density and/or height towards the cutblock boundary. Windfirm stands and multistoried stands are most amenable to this type of practice.

Cutblock screens » The use of timbered strips to block views of recent logging may be a viable option as long as they are not used to excess and as long as they are viewed as a temporary measure.

The following tables show clearcut block size, etc. for each subzone. These tables are intended as a rule of thumb only. They are not intended to replace visual perspective simulation and appropriate landscape design.

Table 5
Maximum Area in Visible Clearcuts
- Plan View

Subzone	Visible Portion of Cutblocks
Preservation	0%
Retention	1 - 5%
Partial Retention	6 - 15%
Modification	16 - 25%

Notes:

1. Refer to Figure 10, for maximum visible clearcut size.
2. Refer to Table 6, page 67, for visual recovery requirements for clearcuts.
3. Percentages apply to logical viewscape units which are usually Visual Quality Objective Units or other topographically defined areas. The unit size is generally the area visible at a fixed glance (approximate field of view in a 35 mm camera with 50 mm lens) from a specified viewpoint.
4. As viewing distance increases, % clearcut area may increase within the indicated limits.
5. As slope increases, % clearcut area should decrease within the indicated limits.
6. As vegetation pattern diversity increases, % clearcut area may increase within the indicated limits.
7. Maximum Modification guidelines are not listed because they are more than adequately addressed by the Basic Guidelines for All Zones.
8. Cut blocks should be distributed over steeper and gentler slopes to ensure that options for future development are maintained.
9. Good design and layout of openings is essential. With poor design and/or major soil disturbance, even minor amounts of visible opening may result in "Excessive Modification".

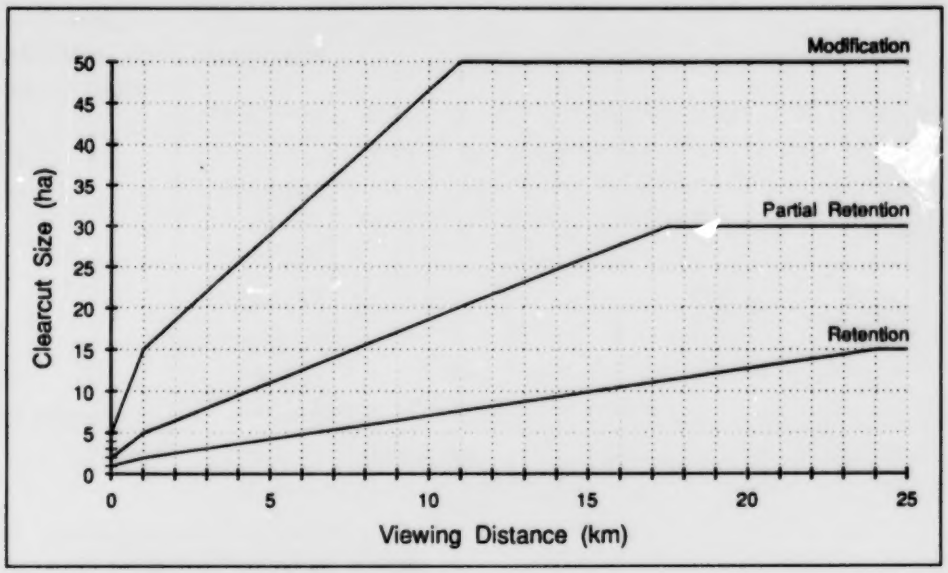


Figure 10 Maximum Visible Clearcut Size - Plan View

Notes:

1. Appropriate size of cutblocks varies with many factors including topographic scale, natural openings, viewing distance, orientation and screening, slope, visible vegetation patterns, angle of view, etc.
2. As scale of topography/landforms increases, opening size may increase.
3. Natural openings, where they exist, can guide the size and shape of visible portions of cutblocks.
4. As slope increases, opening size may decrease (due to reduced tree screening along the lower boundary of openings).

Visual Recovery

The following table shows the height of regeneration required for clearcuts to meet visual recovery requirements for all landscape management subzones.

Table 6
Height of Regeneration Required for Visual Recovery of Clearcuts

	Height of Adjacent Stands in Metres					
Slope	<20	21-25	26-30	31-35	36-40	>40
<15%	4	5	6	7	8	9
16% - 30%	5	5	6	7	8	9
31% - 45%	6	6	6	7	8	9
46% - 60%	7	7	7	7	8	9
61% - 75%	8	8	8	8	8	9
> 75%	9	9	9	9	9	9

Notes:

1. Free-growing stand at target stocking is assumed (refer to Regional Stocking Standards).
2. Stands with less than target stocking may require additional height.
3. Stands in foreground and near middle ground views (< 1 km) may require additional height.
4. Where winter visual greenup is important, heights should be interpreted as height above average snowpack.
5. For clearcutting, the heights indicated should be reached prior to logging adjacent stands.
6. For shelterwood and seedtree systems, the heights of regeneration indicated should be reached prior to final removal cutting.

Selection and Other Partial Cutting

Visual quality objectives can generally be met by using selection and other partial cutting systems as long as sufficient numbers of overstory trees are retained. The following table shows the minimum number of leave trees required for each subzone.

Table 7
Minimum Overstory Leave Trees

Subzone	Minimum Number of Overstory Leave Trees per Hectare in a Partial Cut
Preservation	n/a
Retention	120 - 300+
Partial Retention	60 - 120
Modification	30 - 60

Notes:

1. A relatively closed canopy appearance and target stocking of 400 to 600 trees per hectare at harvest age is assumed.
2. In more open-grown stands fewer overstory leave trees will be required within the indicated limits.
3. In stands with species having narrow crowns (e.g. lodgepole pine, subalpine fir) more overstory leave trees will be required within the indicated limits.
4. As slope increases more overstory leave trees will be required within the indicated limits.
5. Stands in foreground and near middle ground views (< 1 km) will require more overstory leave trees within the indicated limits.
6. In uneven-aged or layered stands fewer overstory leave trees will be required due to the presence of lower crowns within the indicated limits.

Cutblock design

» Shelterwood and seedtree cuts should be carefully designed to ensure that a natural-appearing boundary remains when there is a final removal cut.

Visual recovery

» The same guidelines for visual recovery that apply to clearcuts also apply to the final removal cuts of shelterwoods and seedtrees. Refer to Table 6, Height of Regeneration Required for Visual Recovery of Clearcuts, page 67.

Roads

Avoid Sidecasting » Controlled blasting, end hauling and other techniques should be used on steep slopes to avoid sidecasting.

Right of Ways » Right of ways on steeper slopes should be cleared only as wide as necessary for safe operation. All debris should be disposed of during construction.

Grass Seeding » Visible cut and fill slopes should be grass seeded to reduce visual impact and erosion (see Appendix 3 - Guidelines for Areas Denuded of Vegetation as a Result of Forest Resource Management).

Location » Roads should be located on stable ground in the lower portions of cutblocks and in bench areas where visibility is minimized.

Skid Roads, Landings & Fireguards

Location » Constructed skid roads, landings and fireguards should be avoided on steeper, visible slopes.

Visual impact » Where skid road and fireguard sidecutting results in unacceptable visual impacts, recontouring, grass seeding and other measures to reduce the visual impact may be required.

Landing location » Landings should be located on flatter terrain and on the lower portions of cutblocks to reduce visibility. Rehabilitation following logging may include recontouring, ripping and grass seeding.

Borrow pits » Borrow pits should be recontoured and grass seeded following active use.

Landscape Management Subzones

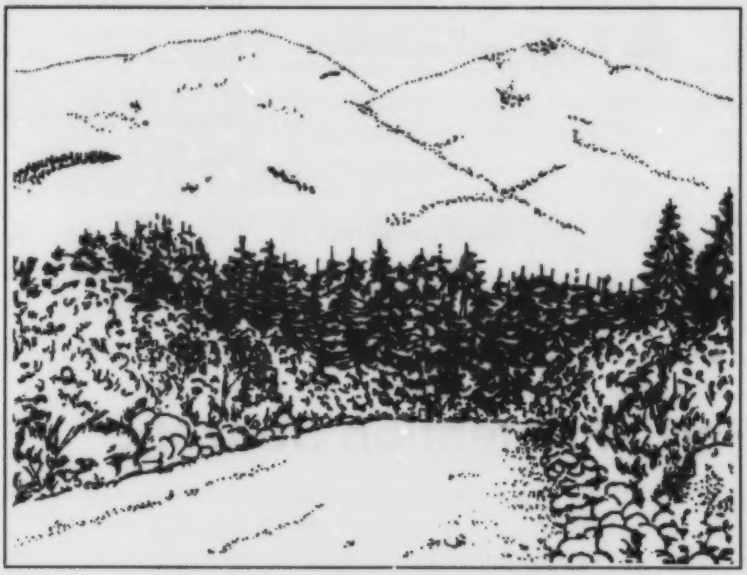
Preservation Subzone

Preservation applies to relatively small areas where landscape values are very high and outweigh other natural resource values, e.g. certain land/water interfaces, special features of visual, historical, geological, biological, and/or educational importance.

Resource activities » No resource activities within this zone should be visible.

Acceptable activities » Acceptable resource activities within this subzone are tree falling and disposal for insect or disease control, fire protection, cleanup of windfall, campsite and trail clearing and danger tree removal. Activities should be compatible with the existing visual quality.

Retention Subzone



Retention applies to areas of high landscape value e.g. continuously forested and/or steep slopes facing important viewpoints and recreation use areas, foreground areas adjacent to important viewpoints and recreation use areas, and along certain shorelines.

Forest management activities may be present but are not noticed by the average viewer. Some visual change may be discernible but is not recognized as being different from existing natural features in the landscape.

Harvesting methods

» Selection logging or other partial cutting systems are preferable in many of the visible areas within this subzone. Benches and small hidden areas may be occupied by small clearcuts, roads and landings. Where selection logging is not feasible, refer to Table 6, Height of Regeneration Required for Visual Recovery of Clearcuts, page 67 for clearcutting guidelines.

Cutblock layout

» Clearcut logging cutblocks should be laid out to take advantage of topographic breaks and vegetative screening.

Sufficient crown closure
» Selection logging or other partial cutting systems should retain sufficient residual crown closure so that it is not immediately noticeable.

Road location and construction
» Roads should be carefully planned and constructed and include measures such as narrow right-of-way clearing, total debris clean-up, controlled blasting, end hauling, good debris cleanup, and grass seeding cut and fill slopes.

Visual simulation
» Visual perspective simulation and appropriate landscape design should be carried out in conjunction with the Pre-Harvest Prescription.

Minimize site disturbances
» Site disturbances should not be visually evident.

Partial Retention Subzone

Partial retention applies to areas where landscape values are moderate to high, generally in foreground and middleground views, and where management activities generally can match the landscape character without creating an obvious intrusion.

Forest management activities are noticeable but do not immediately draw the viewer's attention. Visual change is evident but blends well by repeating naturally occurring form, line, colour, and texture.

Harvesting methods

» Selection logging and other partial cutting systems are often the easiest methods to attain the visual quality objective. Single tree selection, group selection, and shelterwood cuts which leave considerable numbers of overstory trees are generally acceptable. For clearcutting guidelines, refer to Table 6, Height of Regeneration Required for Visual Recovery of Clearcuts, page 67.

Clearcut logging conditions

» Clearcut logging is appropriate if the following conditions are met:

- Scale of cutblocks should be similar to existing natural openings or visible changes in vegetation cover, rockforms, or micro-topography, and should be small enough that they do not begin to dominate natural features.
- Shapes of cutblocks should blend by repeating naturally occurring line, form, colour and or texture.
- Size and shape of cutblocks should be influenced by topographic variations, vegetation patterns, vegetative or permanent screening, viewing angle, viewing distance.

Visual simulation

» Visual perspective simulation and appropriate landscape design should be carried out in conjunction with the Pre-Harvest Prescription.

Minimize site disturbances

» Site disturbances should be minimized.

Modification Subzone

Modification applies to areas of moderate to low sensitivity, generally in middleground and background views, and areas where landscapes are more common. Forest management activities are immediately noticed and draw the viewer's attention, but repeat naturally occurring line and form to blend to the extent possible.

Clearcut logging appropriate

» Clearcut logging is generally appropriate in this subzone.

Natural-looking cutblocks

» Size, shape, and pattern of cutblocks should be designed to create openings which are natural-looking and easy on the eye.

Influences on cutblocks

» Size and shape of cutblocks should be influenced by topographic variations, vegetation patterns, screening, viewing angle, viewing distance existing visual condition.

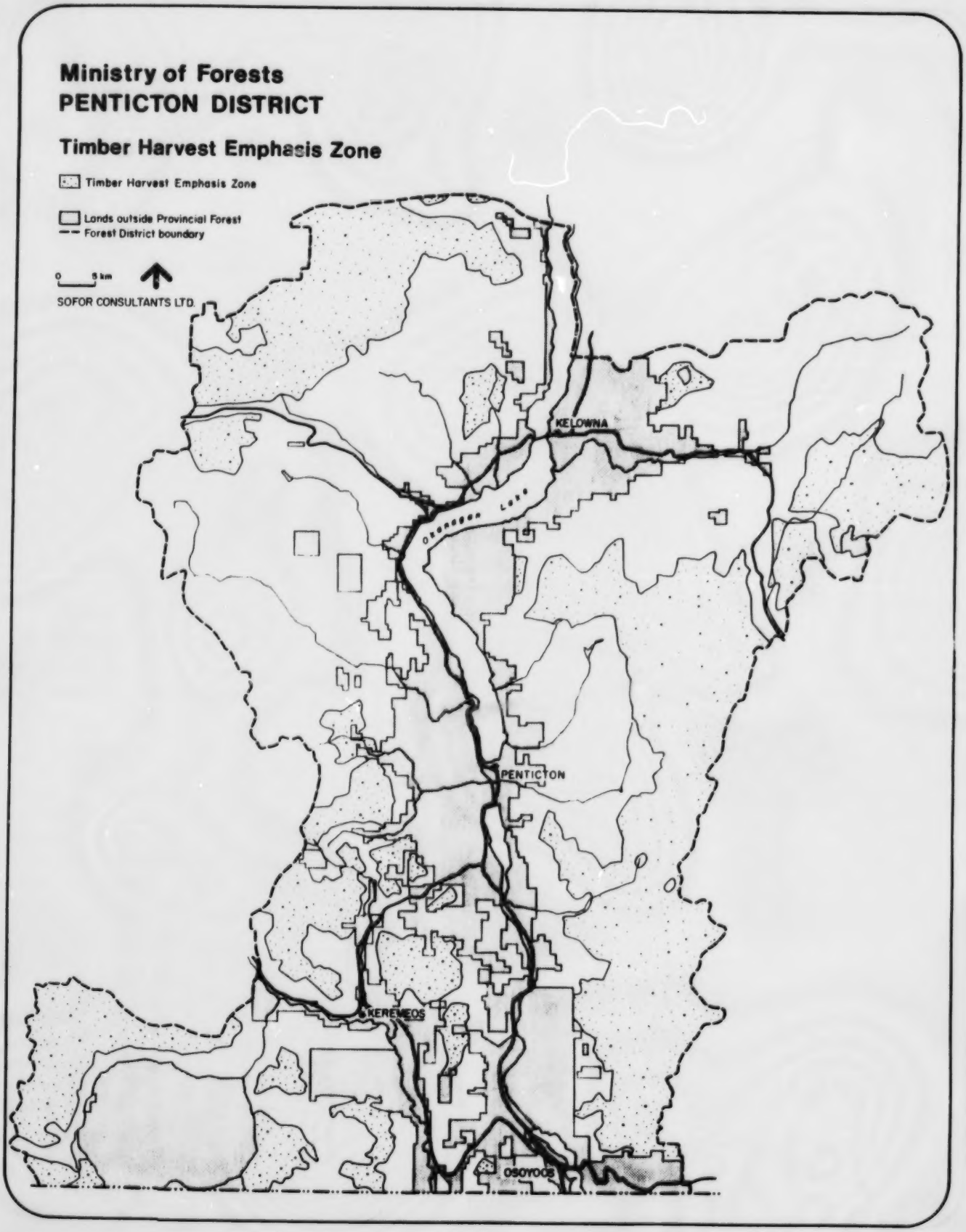
Visual simulation

» Visual perspective simulation and appropriate landscape design may be necessary in some viewsheds to ensure continuity of visual objectives.

Additional guidelines

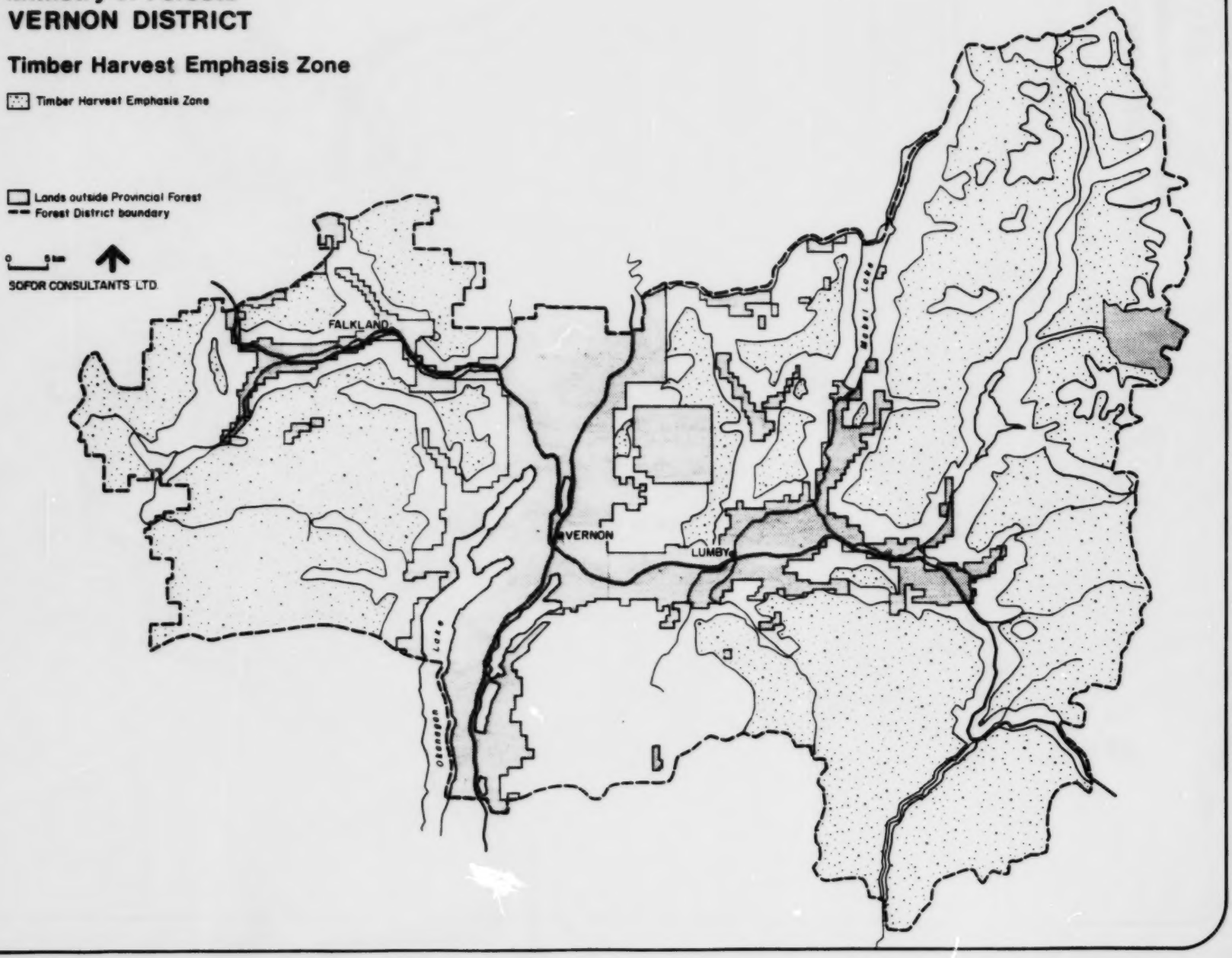
» For additional guidelines, refer to Table 6, Height of Regeneration Required for Visual Recovery of Clearcuts, page 67.

Timber Harvest Emphasis Zone


Ministry of Forests
PENTICTON DISTRICT
Timber Harvest Emphasis Zone
Timber Harvest Emphasis Zone
Lands outside Provincial Forest
Forest District boundary
0 5 km
SOFOR CONSULTANTS LTD.
KELOWNA
PENTICTON
KEREMEOS
OSOYOOS

Ministry of Forests
VERNON DISTRICT

Timber Harvest Emphasis Zone



Ministry of Forests
SALMON ARM DISTRICT

Timber Harvest Emphasis Zone

Timber Harvest Emphasis Zone

Lands outside Provincial Forest
Forest District boundary

0 km

SOFOR CONSULTANTS LTD.

Timber Harvest Emphasis Zone

This zone includes all areas in which there are no major conflicts with community water, ungulate winter range, lakeshore and landscape management. The emphasis in this zone is for the long term optimum harvest of timber while protecting basic resources. **In this zone the Basic Integrated Resource Management Guidelines for All Zones apply.**

Standards and guidelines for managing and enhancing timber values are contained in Ministry of Forests' legislation, policy and procedures.

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B.C.I.T. Manual for Roads and Transportation - Volumes I and II.

Drainage Structures for Logging Roads - by A.B.C.P.F.

Toews, D.A.A. and M.J. Brownlee, 1981. A Handbook for Fish Habitat Protection on Forest Lands in British Columbia.

Also available are Forest Service publications, such as:

Engineering Manual.

Kamloops Forest Region Standard Specification for Construction of Roads.

Glossary

Angle of Repose: The slope angle at which the soil particles are stable (i.e. sand: 20^0 - 35^0, gravel: 30^0 - 48^0.

Biogeoclimatic Zone: A broad geographic unit that has distinguishing characteristics of climate, soil and vegetation.

Branch Road: Access road to a number of cut blocks.

Buffer Strip: Vegetation fringe left intact along a stream, river or lake after logging. Can be deciduous or a mix of deciduous and coniferous species, including a complete assemblage of natural forest.

Canada Land Inventory (CLI) Land Capability for Ungulates: Capability ratings are established on the basis of the optimum vegetational stage that can be maintained. Capability ratings, assigned do not reflect present land use, ownership, lack of access, distance from cities in amount of hunting pressure.

Community Watershed: A watershed on which a community holds a water licence and is the drainage area upstream of the licensed point of abstraction. (see Watershed)

Complete Basin Engineering: The planning of roads and cut blocks throughout a watershed for long term timber harvesting. May be a paper plan but preferably includes field layout.

Crown Closure: The percentage of ground area covered by the crowns of the trees forming the upper canopy layer (dominants, co-dominants and intermediates).

Diameter Breast Height (DBH): The standard height for measuring the diameter of trees. A more accurate measurement than closer to the ground because of the swelling of the tree at the but.

Ephemeral Stream: A stream that flows periodically, such as during spring freshet and/or during some rain storms.

Equivalent Clearcut Area (ECA): The amount of harvested forest land within a watershed which, hydrologically, acts like a clearcut. See explanation in the Basic Guidelines section, page 12.

Fish Habitat: Spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

Fish Stream: A stream supporting fish.

Forested Area: For the purpose of evaluating percent harvested within watersheds, forested area is defined as all areas supporting forest cover within the provincial forest and parkland. Open range, rock, swamps, and water is excluded. Also excluded from watershed units is private land and Indian Reserves.

Free-to-grow: Trees that grow uninhibited from brush, weed and other tree competition.

Green-up: The stage of regeneration of a logged area where there is a satisfactory stocking of established tree species acceptable to the site that have reached a height of at least 3 metres, or 1 metre above the normal maximum snow depth, whichever is greater. Stocking shall meet the standards specified by the Ministry of Forest.

Hydrologic Recovery: The point at which a second growth stand of timber will hydrologically resemble old growth (ie. in terms of timing and quantity of water yield).

Hiding Cover: Any vegetation used by animals for security or escape from danger.

Lakeshore: For the purpose of these guidelines, the lakeshore is defined as the interface between the water or an adjacent riparian area and the upland forested perimeter.

Leave Strip: Natural vegetation fringe left along a stream, river or lake margin or between cut blocks after logging.

Legume Species: Any plant of the family "leguminosae" that is a soil improving plant (i.e. alfalfa, peas).

Low Ground Pressure: Less than 43.4 KPa (6.3 p.s.i.)

Main Road: Access road to a number of cutting permits.

Main Stream: The primary portion of a stream normally having a gazetted name, that is fed by tributaries, extending upstream until the channel width diminishes to 0.6 m.

Natural Debris: Debris that occurs as a result of natural processes in the forest, not man caused.

Natural Boundary: Means the visible high watermark of any lake, river, stream or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river, stream or other body of water thereof, in respect to vegetation, as well as in respect to the nature of the soil itself (Land Act, Section 1). In addition, the natural boundary includes the best estimate of the edge of dormant or old side channels and marsh areas.

Perennial Stream: A stream which has flowing water all year.

Perspective View: The view from a specific siting point, ie. a highway or community. The view as it would appear to the eye is represented on a plane surface.

Planning Cell: Forest inventory and planning units. The Okanagan Timber Supply Area has been divided into 410 planning cells, the boundaries of which generally follow existing management units (i.e. Districts), land tenures (i.e. Indian Reserves), rivers, heights of land, etc.

Plan View: The view from above. Vertical projection onto a plane, providing horizontal dimensions only.

Riparian Area: The wet soil areas next to streams, lakes and wetlands. These areas have high water tables and soils which exhibit characteristics of wetness. Water-loving plants are often associated with these areas.

Second Pass: The next entry to harvest timber after green-up occurs (or other recovery objective).

Sedimentation: The process of subsidence and deposition of suspended matter carried in water by gravity; usually the result of reduction of water velocity below the point at which it can transport the material in suspended form.

Seed Tree Silviculture System: An even-aged management system similar to clearcutting except that a small number of trees are retained (either singly or in groups) to regenerate or supplement regeneration of the site. Seed trees are generally selected from the best dominant and co-dominant trees in the stand, and usually range from 10 to 30 trees per hectare. Seed trees may be harvested when regeneration is obtained, or they may be retained through the next rotation for such purposes as wildlife, biodiversity, aesthetics or increment.

Selection Silviculture System: An uneven-aged management system where trees are periodically removed individually (***single tree selection***) or in small groups less than 0.1 ha in size (***group selection***). Regeneration is continuous through natural seedfall or supplemented by under-planting. Permanent forest cover is maintained. For the purpose of these Guidelines, any selection logging that results in removal of more than 50% of the natural crown closure will be subject to the same constraints as clear-cutting.

Shelterwood Silviculture System: An even-aged management system where a stand of timber is gradually removed in a series of cuts which extend over a fraction of the rotation. Regeneration is established by natural seedfall or supplemented by under-planting, and grows up under the overhead or lateral shelter of an existing overstory. Each shelterwood cutting may be uniformly disbursed throughout the stand (***uniform shelterwood***), or they may take place as a series of edge cuttings in patches that are less than 1 1/2 tree heights wide (***strip shelterwood***). A portion of the stand in a strip shelterwood may be reserved until later in the rotation, thus creating a series of small, even-aged patches. Although the classical intent of a shelterwood is to eventually remove all of the overstory, modern variations may call for retention of part of the overstory for wildlife, biodiversity, aesthetics or increment purposes.

Side Stream: A tributary stream, having no gazetted name, flowing into a main stream.

Snag: A standing dead tree. The Workers' Compensation Board and the Ministry of Forests have traditionally required that all snags greater than 3 m in height be felled during harvesting operations.

Snowpack Area: That part of the drainage basin where snow accumulation provides the major source of water production.

Spur Road: Access roads on the cut block.

Stream: Includes a natural watercourse or source of water supply, whether usually containing water or not.

Stub Snag: A broken off or cut off dead tree with usually no branches left. These are the only snags that the Workers Compensation Board will permit left on a logged area and only if they are less than 3 m tall. The WCB does allow slightly taller stub snags to be created by cutting off live trees with a mechanical feller.

Subdrainage: The total natural upstream land drainage area encompassing a tributary stream within a larger watershed.

Successional Stages: Different forest ecosystems that exist in the transition from no forest cover to mature climax forest.

Swamp Complex: One or more swamps recognizable as a single unit whose combined area exceeds 2 ha.

Temporary Bridges: Stream crossing used for access that are removed before next freshet.

Temporary Culverts: Stream crossing used for access that is removed before next freshet.

Thermal Cover: Cover used by animals to ameliorate effects of weather.

Total Chance Logging: Planning over a large area where all resource values are considered within a long time frame. See FERIC Handbook No. 4 "Timber Development Planning for the B.C. Interior: the Total Chance Concept", 1983

Travel Corridor: A route followed by animals along a belt or band of suitable cover or habitat.

Treatment Unit: A harvesting unit that has only one silviculture system and one harvesting system.

25-year Flood: A streamflow of such magnitude that has the probability of occurring once in 25 years.

Vegetated Buffer: A buffer strip within which the vegetation is protected. Harvesting of merchantable timber may be allowed but all non-merchantable stems and deciduous growth is to remain intact.

Water Bar: A ditch cut across a road or skid trail with a minimum skew of 30^0; and a ditch block. It is designed to intercept surface and ditch water and to direct it across the road into stable vegetative matter or rip-rap. The ditch should be 40 - 65 cm deep at the upstream end and sloped to permit unrestricted water flow.

Watershed: The total natural upstream land drainage area above any point of reference on a stream.

Wetted Perimeter: That portion of a stream below the normal highwater mark.

Wildlife Corridor: See Travel Corridor.

Wildlife Tree: A tree in the natural forest that produces a home for a variety of wildlife species, usually a dead tree with cavities.

Windfirm Strip or Reserve: An area subject to normal (natural) levels of single tree or small patch blowdown, but <u>not</u> prone to additional amounts of blowdown resulting from adjacent or nearby harvesting activities.

Wolf Tree: A large-crowned, limby tree usually resulting from "open grown" conditions. The large crowns and many branches make these trees more valuable to wildlife in terms of interception of precipitation, reradiation of solar warmth and actual habitat for smaller wildlife amongst the branches.

Appendices

Appendix 1
Maximum Harvest Levels for Specific Watersheds

Maximum Harvest Levels for Specific Watersheds (Percent Equivalent Clearcut Area)

Penticton	Max. %	Vernon	Max. %	Salmon Arm	Max. %
Park Rill	20%	Alberts Rd.	20%	Anstey R.	25%
		Bessette Cr.	25%	Blurton Cr.	25%
		Chase Cr.	20%	Canoe Cr.	25%
		Harris Cr.	25%	Chase Cr.	20%
		Ireland Cr.	25%	Eagle R.	25%
		Salmon R.	25%	Hunakwa Cr.	25%
		Trinity Cr.	25%	Johnson Cr.	25%
		Wap Cr.	25%	Kingfisher Cr.	25%
				Noisy Cr.	25%
				Onyx Cr.	25%
				Salmon R.	25%
				Scotch Cr.	25%
				Seymour R.	25%
				Tappen Cr.	25%
				Wap Cr.	25%

Appendix 2
Interim Soil-Disturbance Ground Rules for the Interior of B.C.

Province of
British Columbia

Ministry of
Forests

File:

515 Columbia
Kamloops, B.C.
V2C 2T7
June 13, 1989

All Licensees
Kamloops Forest Region

Dear Sir:

Re: Interim Harvesting Guidelines

Please refer to my letter of November 9, 1988 and the interim Site Disturbance Guidelines that were attached thereto. Effective immediately, those Regional guidelines will be replaced by the recently approved Provincial Interim Harvesting Guidelines (copy attached). This guideline package establishes the following parameters:

1. Maximum soil disturbance levels by site sensitivity class.
2. A site sensitivity rating methodology.
3. Categories of soil disturbance.
4. A survey measurement methodolody.

All aspects of these guidelines will be implemented in the Kamloops Forest Region for a two year trial period, however, it is emphasized that the referenced soil disturbance levels are maximum values, based on a Provincial perspective, and should not be used to modify or relax performance standards already being achieved in various parts of this Region. The intent of the guidelines is to pave the way towards improved logging practices and decreased site disturbance levels, not to reduce management practices that already exist or have been achieved for a number of years.

Within the above-noted trial period, it is our itent, under the auspices of the IFHC, to develop localized site disturbance guidelines for the Kamloops Region, through the Regional Interior Forest Harvesting Steering Committee (RIFHSC). We plan to establish "benchmark" sites over a matrix of climatic zones and sensitivity classes. These sites will be representative of good logging practices and will be utilized to establish realistic and attainable site disturbance objectives in the context of local conditions and circumstances. The process for the above project will be as follows:

1. Selection of representative sites by July 1.
2. Survey of sites by September 1.
3. Synthesis of data and final report by September 15.
4. Review of selected sites by RIFHSC by October 15.
5. Development of report to IFHC by January 1, 1990.

If you have any comments about implementation of this procedure, please discuss with your respective District Manager.

Yours truly,

P. E. Levy
Regional Manager
Kamloops Forest Region

KB/PEL/hlg
c.c. District Managers - Kamloops Forest Region
M. J. Wilkins, Chairman IFHC

INTERIM HARVESTING GUIDELINES
FOR THE INTERIOR OF B.C.

The objective of these guidelines is to prevent unnecessary soil disturbance. The means by which unnecessary soil disturbance is to be prevented is through the development and implementation of simple, easy to administer harvesting guidelines aimed at controlling the occurrence of bladed structures and heavily travelled skid trails. Emphasis in these guidelines is placed on improved pre-harvest planning as the primary mechanism for controlling soil disturbance.

These guidelines apply to harvesting-related disturbance only. Disturbance resulting from silvicultural activities (including that resulting from fire guard construction) will be dealt with by the IFHC TAC as part of the next phase of guideline development.

It is acknowledged that these guidelines are simplistic. However, it is recommended that they be viewed as an important first step towards the development of a refined, more comprehensive set of guidelines. Because these guidelines are interim only, local experience and common sense should be used in their implementation. It is critical that research and operational information continue to be collected and directed to the TAC on an ongoing basis so that timely and appropriate refinements to the guidelines can be made.

It is emphasized that the percent allowable disturbance levels are the provincial standards and are maximum allowable levels for any cutblock of a given sensitivity class. These guidelines should not preclude lower limits being achieved on a site-specific basis depending upon site characteristics and local experience. It is intended that the total cumulative level of soil disturbance from all categories of soil disturbance not exceed the maximum allowable level prescribed in accordance with the site's sensitivity rating. The area of definition for the application of the guidelines is the cutblock; however, site sensitivity will also determine whether smaller treatment units within cutblocks, or smaller cutblocks, should be defined.

A standardized provincial survey method for estimating soil disturbance levels has recently been developed, and should be used on all areas where soil disturbance measurements are undertaken either operationally or experimentally. This will ensure that information collected from different areas is directly comparable. It is recognized that skid roads constructed on snow may represent a measurement problem because of the potential occurrence of shallow, non-compacted soil material that results after snow melt along the outer edge of some trails. Judgment will have to be applied in the soil disturbance measurement procedure in such situations. In most such cases it is recommended that the advice of the regional soils specialist be sought before implementing the measurement procedure.

DEFINITIONS

Soil Disturbance:	Any abrupt change in the physical, chemical, or biological properties of the soil. In the context of these guidelines, soil disturbance refers to bladed or heavily used skid roads, landings, or similar roadside work areas, and unapproved haul roads.
Detrimental Soil Disturbance:	Soil disturbance that reduces site productivity is considered detrimental. Site sensitivity has a direct bearing on whether soil disturbance is detrimental or not.
Approved Haul Roads:	Haul roads which are indicated on the harvest plan or under subsequent minor amendments.
Unapproved Haul Roads:	Any haul roads which are not identified on the harvest plan.

GUIDELINES

1. Site Sensitivity and Allowable Soil Disturbance Levels

- Allowable soil disturbance levels must be related to site sensitivity. These guidelines are based on the site-sensitivity rating system currently being developed by Terry Lewis for the

B.C. Ministry of Forests Timber Harvesting Subcommittee, an example of which is attached. Similar rating systems may be available from individual regional Ministry of Forests offices. In the absence of similar regional systems, the use of the Lewis model is recommended.

- The percent allowable level of soil disturbance is a cumulative total (i.e., the sum of unapproved haul roads, landings, backspar trails, skid roads, and heavily used skid trails) and varies depending upon the sensitivity rating of the site as follows:

Sensitivity rating	Percent total allowable soil disturbance
Very high	4
High	9
Moderate	19
Low	19

2. Haul Roads and Landings

- Approved haul roads are excluded in soil disturbance calculations for cutblocks. The location of haul roads will be identified on the harvesting plan or map included with the cutting permit application. Approved minor amendments subsequent to cutting permit application approval will also be excluded. Unapproved haul roads and roads associated with access logging will be included in the soil disturbance measurements for the cutblocks. These guidelines are not intended to encourage replacement of skid trails with haul roads on cutblocks, and the Ministry of Forests representative is expected to ensure that approved haul road densities are acceptable.

- The cumulative total area of disturbance related to landings and to the widening of roads for log handling purposes, will not exceed four percent of the total cutblock area.

The locations and approximate dimensions of landings will be identified on the harvesting plan or map and included with the cutting permit application. Landings and haul roads are mutually exclusive so measurement of landings is done outside haul roads. Soil disturbance will be measured from the top of the cut to the toe of the fill.

- Widening of haul roads beyond the standard width to accommodate roadside logging systems will be considered as disturbance if the widened areas have been bladed or "heavily used." "Heavily used" areas, if not bladed, are characterized by at least a 5-cm deep impression in the mineral soil, which is indicative of soil compaction and/or rutting. All such areas will be included in soil disturbance measurements.

3. Backspar Trails

- The area occupied by backspar trails is included as disturbance under these guidelines and will not exceed 3-5% of the total cutblock area. Where possible, backspar trails should serve as fire guards.

4. Fire Guards

- Fire guards will be excluded from these guidelines until such time as the TAC receives advice from the Protection Branch of the Ministry of Forests.

5. Skid Trails and Skid Roads

- For the purposes of these guidelines, soil disturbance from bladed skid roads will extend from the top of the cut to the toe of the fill. Heavily used areas which are counted as soil disturbance

are those with at least a 5-cm deep impression in the mineral soil, indicative of compaction and/or rutting. Depending on Site Sensitivity, bladed skid roads and heavily used skid trails will not exceed fifteen percent (15%) of the total cutblock area (see items 1 and 2 above). On very highly sensitive and high sensitive sites, total disturbance cannot exceed 4% and 9% respectively, so the allowable amount attributable to bladed skid roads and heavily used skid trails on such sites is less accordingly.

- With regard to skid road layout planning, a reasonable approximation of skid road location and density must be made at the pre-harvest stage and, depending on local conditions, may be refined as field planning becomes more definite. Skid road locations must be identified on harvesting plans or maps before issuance of the cutting permit, and laid out on the ground before construction begins, tempered with on-site considerations.

Province of British Columbia

Ministry of Forests

MEMORANDUM

To: Regional Managers
Operations Division

March 1, 1991

FILE: 200-20/IFHC

From: W. C. Cheston
Assistant Deputy Minister
Operations

Re: Fire Guard Construction Guidelines

Attached is a copy of the Fire Guard Construction Guidelines as developed by the Interior Forest Harvesting Council.

The guidelines are effective starting May 1, 1991. As the guidelines are straight forward they will not require the implementation effort that went into the harvesting guidelines.

The guidelines shall be considered as "interim" guidelines. They will be evaluated after the slash burning season. You should note that the disturbance allowance for fire guards is in addition to those allowed for harvesting.

Please ensure that all your licensees receive a copy of the guidelines.

W. C. Cheston
Assistant Deputy Minister
Operations

Attachment

cc: Interior Forest Harvesting Council Members

Mr. Jim Dunlop, Director
Protection Branch

FIRE GUARD CONSTRUCTION GUIDELINES

1. Fire guards, location and type must be identified at the pre-harvest stage, and depending on local conditions including burn objectives, be refined as field planning becomes more definite.

2. All fire guards, regardless of type, must adequately protect adjacent values from escape potential.

3. Appropriate fire guard type will be dependent on fuel loading and site sensitivity.

4. On Low to Moderate sites, bladed fire guards may be used if required.

5. On High to Very High Sensitivity blocks, bladed fire guards are strongly discouraged. Excavator or hand constructed guards are recommended.

6. For fire guard construction, a disturbance of 4% is considered maximum.

7. On all blocks, bladed fire guards are only to be used if really needed for protection.

8. Block layout should take advantage of existing roads, topography, backspar trails and skid roads to minimize the amount of soil disturbance.

9. Where slash accumulation adjacent to the fire guard presents a significant risk, feathering of slash should be considered.

10. On steeper slopes prone to erosion, use of waterbars and/or legume grass seeding should be considered.

December 18, 1990

Appendix 3
Guidelines for Areas Denuded of Vegetation as a Result of Forest Resource Management

Guidelines for Areas Denuded of Vegetation as a Result of Forest Resource Management[1]

Revegetation seedings and plantings are effective forest land treatment measures to use in the rehabilitation of areas denuded of vegetation during the harvesting of forest resources. The value of revegetation in reducing soil erosion and stream or lake sedimentation has long been recognized by management agencies. The plant residue and roots improve the structure and water infiltration capabilities of severely compacted sites. Revegetation may prevent invasion of undesirable plants and afford shade for the establishment of shade requiring tree species.

The types of vegetation denuded areas that could benefit from revegetation seedings are cutslopes, fillslopes, waste areas, borrow areas and sidecast areas of roads, deactivated road surfaces, landings, skid roads, skid trails and eroded or potentially erodible sites.

The following information is presented to assist the land manager in the rehabilitation of disturbed or vegetation denuded areas.

What Species and Rate of Seed to Plant

The selection of species and rate to plant should be based on the ecosystem type, the type of disturbance, and the objective or purposes for seeding.

Selection of species based on the ecosystem type is not possible at this time because of the lack of reliable data, therefore species on the basis of biogeoclimatic zones is used in this guide. See Table 1 and 2.

The rate of seeding should also be based on the seeds per pound and germination percent. There is a wide range in the number of seeds in a pound for different species. Redtop, for example, has 5,000,000 seeds per pound compared with Crested Wheatgrass with 200,000 seeds per pound. The species composition of the grass-legume mixes in Table 2 were adjusted to compensate for the variability in seeds per pound and germination percent. If alternate grass or legume species are used, adjustments should be made using Table 3.

Time of Seeding

The success or failure of revegetation can depend on the time of seeding and the variation in climatic conditions from one year to another. Normally areas disturbed in winter and early spring timber harvesting should be seeded in early spring. Disturbance in the summer and fall should be seeded in the late fall. Early fall seedings are risky as the seed will germinate and be destroyed by frost heaving during the late fall, winter or early spring. Reasonable success has been acquired by seeding on the snow during the winter. Seed as soon as possible after disturbance considering the above limitations.

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[1] Mitchell, W.R. and M.T. Wallace, 1978. Research Division, Kamloops Forest Region, Kamloops, B.C.

Seed Bed Preparation

The success or failure of revegetation can depend on seed bed preparation as much as other factors, such as the site, etc.

A good seed bed is characterized by:

- » Loose granular soil on the surface and a firm, but not compacted subsoil. Never seed on a hard crusted surface, unless a mulch or harrow is used to cover the seed.
- » Moisture present in the subsoil and preferably in the surface. If precipitation is expected in a few days, seedings have been successful when the surface soil is dry, if there is moisture in the subsoil.
- » Exposed mineral soil for seed germination. Mixing of the organic (duff) and mineral soil also make a satisfactory seed bed for planting.
- » A rough surface for broadcast seeding. The first moisture will assist in washing and covering the seed with soil material.
- » Sufficient nutrients available for establishment. Deep disturbance exposing the subsoil usually requires fertilization for good establishment of seedlings.

Specific Seed Bed Preparation for Different Types of Denuded Areas

Haul Roads (Cutslopes, Fillslopes, Borrow, Waste and Sidecast Materials)

- » Leave cutslopes rough, don't blade with a smooth surface.
- » Vary the treatment of cutslopes.
    1. Cutslopes in unconsolidated soil material with slope ratios flatter than 1 1/4 to 1 can be grass-legume seeded without mulching.
    2. Cutslopes in consolidated soil material with slope ratios of 3/4 to 1 1/4 to 1 should be mulched when grass seeded.
    3. Cutslopes in unconsolidated soil with slope ratios of less than 3/4 to 1 and cutslopes in consolidated bedrock should not be grass-legume seeded or mulched.
- » Fertilize if nutrients are too poor for seeding establishment, this is especially true for cutslopes and excavated borrow areas.
- » Seed as soon as possible after disturbance.

Permanently and Temporarily Abandoned Roads, Skid Roads and Landings

- » Rip or scarify compacted road surfaces and landings.
- » Seed as soon as possible after disturbance.

Skid Trails, Fireguards and Logging Disturbed Areas

- » Usually will not need any site preparation if they are seeded as soon as possible after disturbance.

How to Seed

Depending on the type of disturbance, motorized broadcast seeders, aerial seeding, drilling and hand seeders have all been used with success.

Motorized broadcast seeders have been efficient and successful for seeding of road disturbed sites. Aerial seeding with a fixed wing plane is efficient and has been successful for skid trails and logging disturbed areas. Cyclone type hand seeders are good for isolated pockets of denuded areas or short steep spur roads and skid roads. Drilling is a good method to be used for deactivated roads and for landings, although if they are scarified, motorized broadcast seeders are usually more efficient.

Forage Utilization

During the first two to three years grazing is not the primary objective for this type of seeding. Erosion control and site rehabilitation are the primary objectives.

Some wildlife and livestock use is anticipated, but heavy concentration and use should be avoided during the first two or three years. After the sites have been effectively rehabilitated, especially permanently and temporarily abandoned roads, skid roads and skid trails, properly controlled grazing should not adversely effect the sites for tree establishment and continued erosion control.

Table 1
Guidelines for Grass Seeding of Areas Denuded of Vegetation

Biogeoclimatic Zone	*Other Subdivisions	Species Mix	Rate of Seed (kg/ha)	Fertilizer** Type	Fertilizer** Rate (kg/ha)
Coastal Western Hemlock (CWH)	Erosion control	A	50	13-16-10	450 - 560
				18-18-18	335 - 390
	Seedling establishment	B		13-16-10	450 - 560
Engelmann Spruce - Subalpine Fir (ESSF) and Montane Spruce (MS)	Erosion control	G	45	13-16-10	335 - 450
	Seedling establishment	H			
Interior Cedar - Hemlock (ICH)	Erosion control	A	45	13-16-10	335 - 450
	Seedling establishment	B			
Interior Douglas Fir (IDF)	Erosion control	C	40	13-16-10	335 - 450
				16-20-0	280 - 335
	Seedling establishment	D		34-0-0	170
Ponderosa Pine (PP) and Bunchgrass (BG)	Erosion control	E	35	13-16-10	225 - 335
				16-20-0	225
	Seedling establishment	F		34-0-0	110
Sub-Boreal Spruce (SBS) & Sub-Boreal Pine/Spruce (SBPS) - Clay Material	Erosion control	K	45	13-16-10	335 - 450
				18-18-18	280 - 335
	Seedling establishment	L		13-16-10	335 - 450
				18-18-18	280 - 335
Sub-Boreal Spruce (SBS) & Sub-Boreal Pine/Spruce (SBPS) - Sandy Material	Erosion control	M	40	13-16-10	335 - 450
				18-18-18	280 - 335
	Seedling establishment	N		13-16-10	335 - 450
				18-18-18	280 - 335

* Erosion control mixes provide the best soil protection, but the rhizomatous grasses may compete with tree seedlings

** If fertilizer is a concern related to water quality, omit fertilizer and double rate of seeding

TABLE 2

GRASS-LEGUME SPECIES MIX

MIX #	PERCENT COMPOSITION (By weight)	PREFERRED SPECIES	ALTERNATE SPECIES
A	30	Perennial Ryegrass	
	20	Creeping Red Fescue	Hard Fescue
	10	Redtop	Timothy
	10	Kentucky Bluegrass	Canada Bluegrass
	20	Red Clover	Birdsfoot Trefoil
	10	Alsike Clover	White Clover
B	20	Perennial Ryegrass	
	40	Orchardgrass	Smooth Brome
	15	Timothy	Meadow Foxtail
	5	Redtop	Kentucky Bluegrass
	10	Alsike Clover	Ladino Clover
	10	White Clover	Red Clover
C	30	Perennial Ryegrass	
	30	Intermediate Wheatgrass	Pubescent Wheatgrass
	20	Creeping Red Fescue	Hard Fescue
	5	Kentucky Bluegrass	Canada Bluegrass
	10	White Clover	Red Clover
	5	Alfalfa	Sweet Clover
D	30	Perennial Ryegrass	
	20	Orchardgrass	Smooth Brome
	25	Intermediate Wheatgrass	Pubescent Wheatgrass
	10	Timothy	Hard Fescue
	10	Alfalfa	Sweet Clover
	5	Red Clover	White Clover
E	50	Streambank Wheatgrass	Pubescent Wheatgrass
	25	Crested Wheatgrass	
	10	Hard Fescue	
	10	Alfalfa	
	5	White Clover	Sweet Clover

MIX #	PERCENT COMPOSITION	PREFERRED SPECIES	ALTERNATE SPECIES
F	50	Crested Wheatgrass	
	35	Pubescent Wheatgrass	Streambank Wheatgrass
	10	Alfalfa	
	5	Sweet Clover	
G	30	Perennial Ryegrass	
	30	Creeping Red Fescue	Hard Fescue
	20	Timothy	Orchardgrass
	5	Redtop	Kentucky Bluegrass
	10	Alsike Clover	
	5	White Clover	
H	30	Smooth Brome	Mountain Brome
	30	Orchardgrass	
	15	Timothy	Meadow Foxtail
	15	Alsike Clover	
	10	White Clover	

TABLE 3 - SPECIES AND SEED CHARACTERISTICS

SCIENTIFIC NAME	COMMON NAME	VARIETIES	SEEDS PER POUND (THOUSANDS)	SEED QUALITY (GERMINATION)
Agropyron cristatum	Crested Wheatgrass	Fairway, Summit	200	85
Agropyron intermedium	Intermediate Wheatgrass	Greenar, Chief	100	85
Agropyron riparium	Streambank Wheatgrass	Sodar, Commercial	170	80
Agropyron trichophorum	Pubescent Wheatgrass	Greenleaf, Commercial	91	85
Agrostis alba	Redtop	Renton, Commercial	5,000	85
Alopecurus pratensis	Meadow Foxtail	Canada #1	900	80
Bromus inermis	Smooth Brome	Manchar, Magna	125	85
Bromus marginatus	Mountain Brome		90	85
Dactylis glomerata	Orchardgrass	Kay, Sterling, Summac, Majestic	540	80
Festuca ovina duriuscula	Hard Fescue	Durar	565	85
Festuca rubra rubra	Creeping Red Fescue	Boreal	615	80
Lolium perenne	Perennial Ryegrass	Manhattan, Commercial	247	90
Phleum pratense	Timothy	Climax, Champ	1,300	80
Poa compressa	Canada Bluegrass	Canada #1	2,500	75
Poa pratensis	Kentucky Bluegrass	Delta, Kenon, Canada #1	2,156	75
Lotus uliginosus	Bigtrefoil		1,000	85
Medicago sativa	Alfalfa	Rambler, Ranger, Rhizoma, Roamer, Dry-lander	225	85
Melilotus alba	Sweet Clover	Polara, Canada #1	262	85
Trifolium hybridum	Alsike Clover	Aurora, Tetta, Canada #1	682	90
Trifolium pratense	Red Clover	Alta Swede, Canada #1	281	90
Trifolium repens	White Clover		800	85
Trifolium repens latum	Ladino Clover	Ladino, Pilgrim	800	95

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- British Columbia Highways, Maintenance Establishment, Kamloops.

- British Columbia Forest Service, Range Division Staff on the Different Districts.

- A. Mclean with Range Research, Canada Department of Agriculture contributed valuable information during many work sessions.

Appendix 4
Streams Where Harvesting is Not Permitted Within the Riparian Management Subzone

The list of streams where harvesting is not permitted within the Riparian Management Subzone was not complete at the time of publication. Those streams should be identified by the appropriate resource agency at the development planning stage or through other planning processes.

In the interim, streams listed in Appendix 1 should be considered as those most likely to require additional protective measures.

Appendix 5
Process for Selection Cuts on Ungulate Winter Range Zones*

* Adapted from: Armleder, H. 1986. Handbook for Timber and Mule Deer Management Coordination on Winter Ranges in the Cariboo Forest Region. Ministry of Forests.

Why log differently on winter range?

Mule deer need good quality winter range to survive winter and bear young in the spring. Because deer face the worst weather conditions and the poorest quality food during the winter, it is important that they be provided with areas of shallow snow, sufficient shelter and adequate food. Common types of logging do not preserve these winter range values, and therefore when a decision has been made to log on a winter range, it should be done as described here.

How to log on winter range

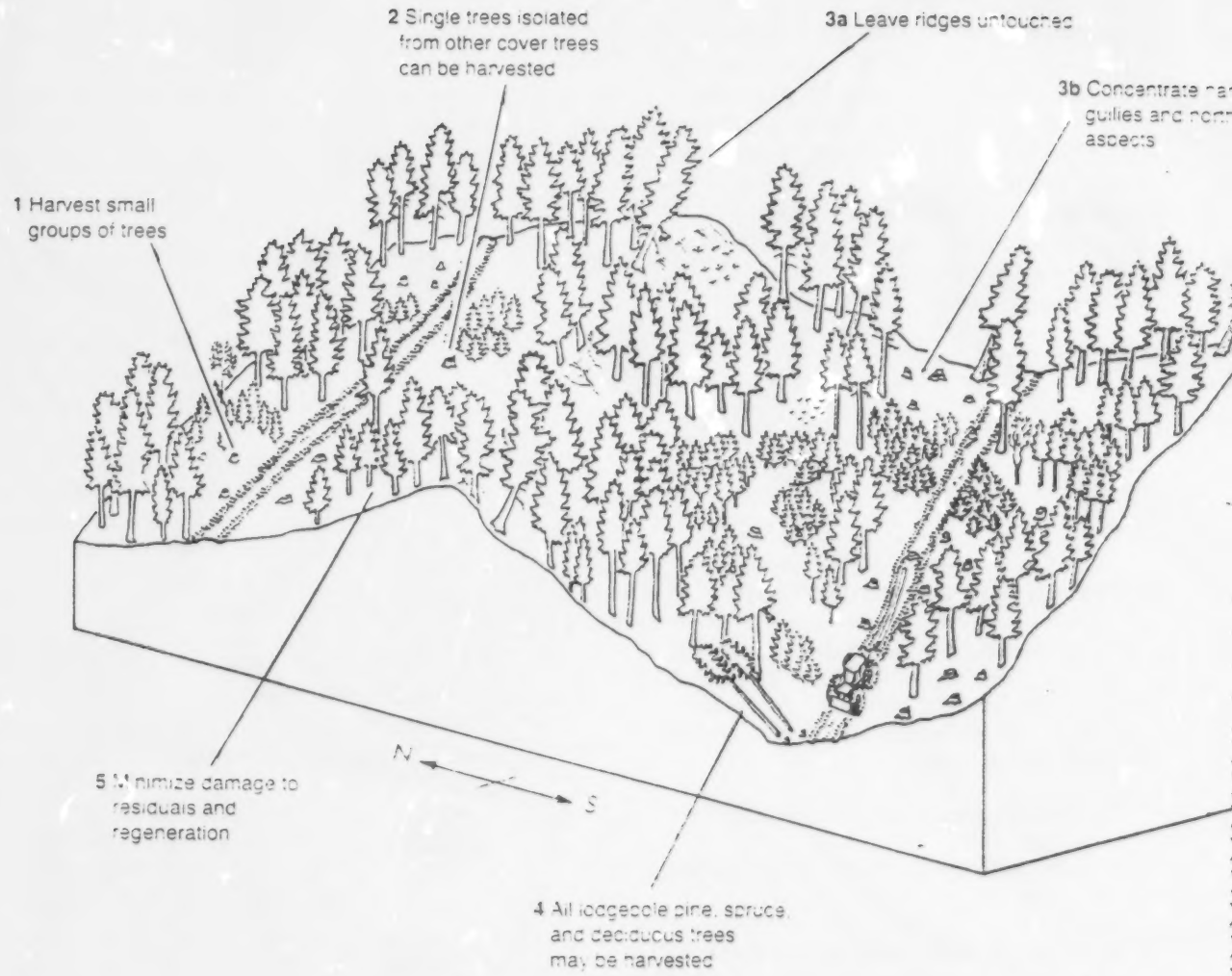
To protect mule deer habitat and still produce timber, LOW VOLUME SELECTIVE LOGGING should be used on winter range. The faller should select which trees to cut using:

1. the information in this pamphlet; and
2. the selection criteria in the logging contract.

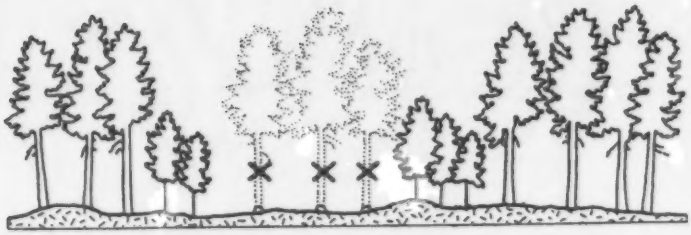
Best results will be achieved if the entire crew is aware of the specialized practices described here for logging on winter range.

Steps for logging on winter range

- Locate major ridges, gullies and timber types within the cutblock before building landings and skid trails.
- Lay out and construct narrow skid trails to access the whole cutblock, but do not build trails along ridges.
- Estimate the number of loads to come from the area serviced by each landing to meet the percent volume removal for each timber type.
- Fall in two passes.
- On the first pass, cut fewer trees than needed to meet the percent removal, concentrating on the pine and spruce (if they are present).
- On the second pass, remove additional trees to reach the percent volume removal, including rub trees and those with severely damaged crowns.

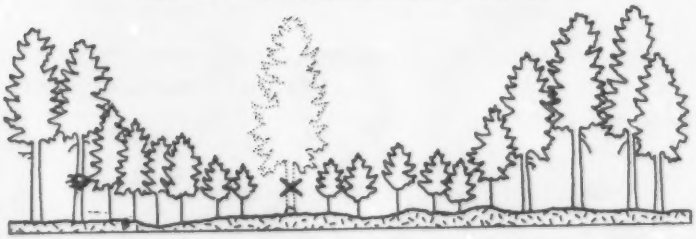

2 Single trees isolated from other cover trees can be harvested
3a Leave ridges untouched
3b Concentrate ha
gullies and north
aspects
1 Harvest small groups of trees
5 Minimize damage to residuals and regeneration
N
S
4 All lodgepole pine, spruce, and deciduous trees may be harvested

1. HARVEST SMALL GROUPS OF TREES



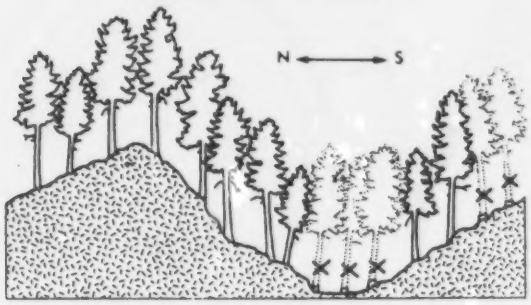
Cut groups of trees rather than uniformly thinning the stand because clumps of cover trees are essential to deer. Typically, not more than 2 to 6 trees should be cut as a group.

2. SINGLE TREES ISOLATED FROM OTHER COVER TREES CAN BE HARVESTED



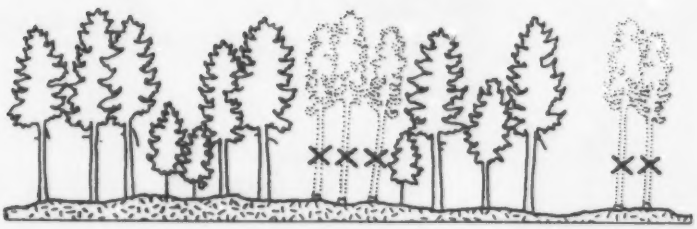
Single, isolated trees are less important to deer because they do not intercept much snow and are difficult for deer to reach when the snow is deep.

3a. CONCENTRATE HARVEST IN GULLIES
3b. AND NORTHERLY ASPECTS WHILE LEAVING RIDGES



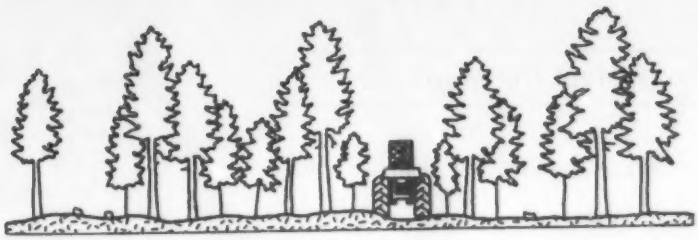
Ridge-tops and knolls are very important to deer and should not be logged. Warm southerly aspects are also valuable and should only be logged lightly. More trees can be cut in gullies and on northerly aspects.

4. ALL LODGEPOLE PINE, SPRUCE, AND DECIDUOUS TREES MAY BE HARVESTED



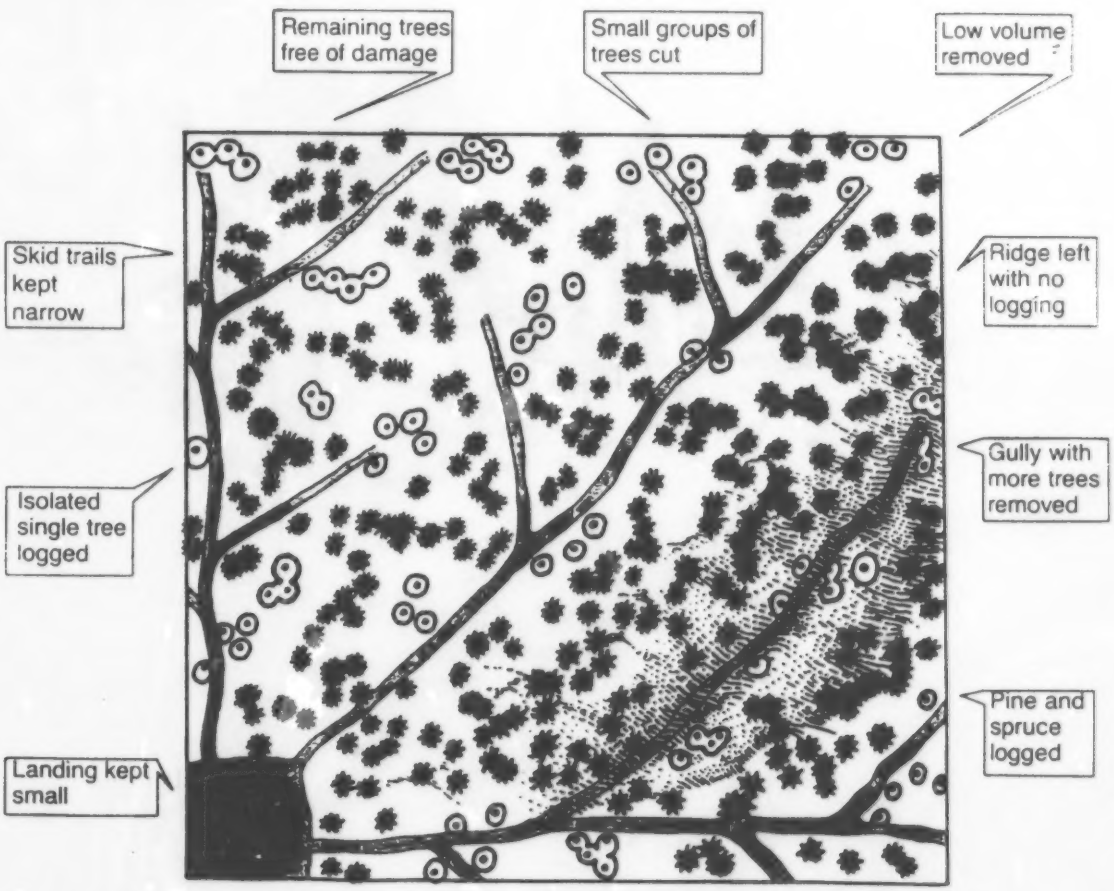
Lodgepole pine and spruce are less valuable than Douglas-fir on winter range. As much of these species as possible should be logged to meet the percent removal for the timber type.

5. MINIMIZE DAMAGE TO RESIDUALS AND REGENERATION



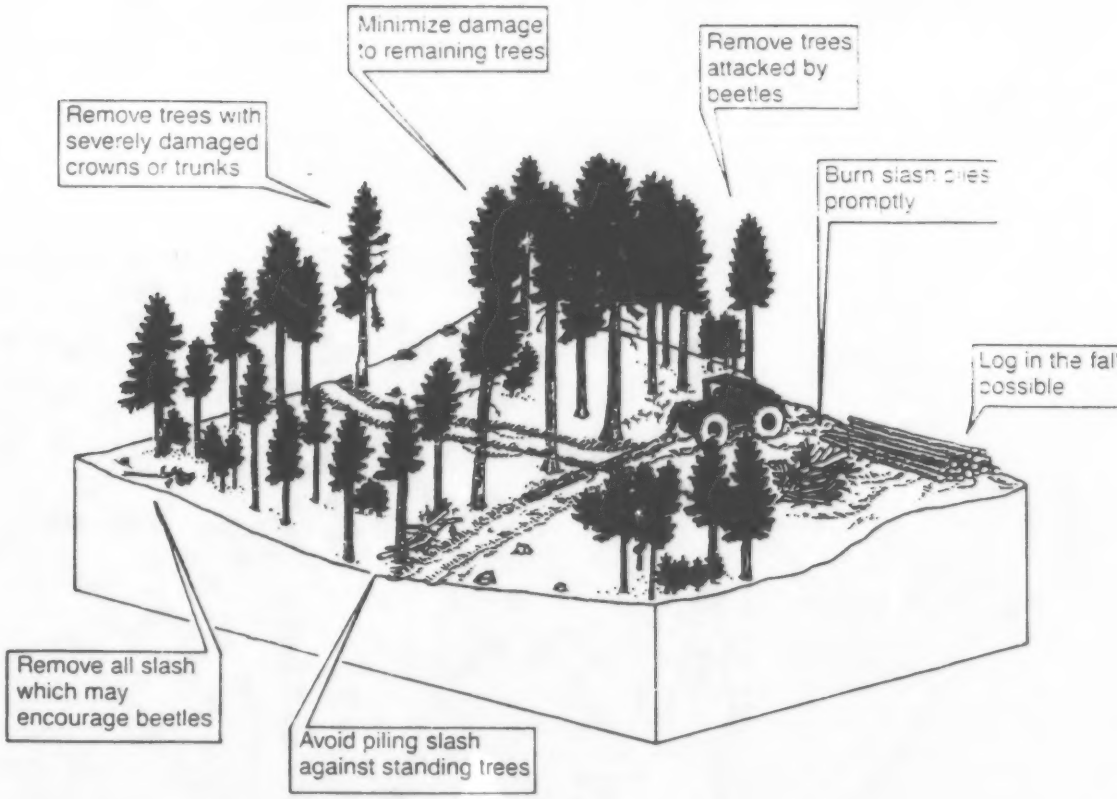
The logging pattern

Part of a typical cutblock of winter range logging is shown below. Note that skid trails are carefully located since they may be used for future passes. Approximately 1 to 6 trees are cut in patches and the ridge is left unlogged; more trees are cut in the gully.


Remaining trees free of damage
Small groups of trees cut
Low volume removed
Skid trails kept narrow
Ridge left with no logging
Isolated single tree logged
Gully with more trees removed
Pine and spruce logged
Landing kept small

How to protect the stand

Because the maintenance of large, old Douglas-fir is of prime importance to deer, extra care must be taken during logging to minimize damage to these trees and to discourage the spread of beetles. Young trees must also be protected so they can grow to provide deer habitat and contribute to future cuts. Ways of protecting the stand are indicated below.


Minimize damage to remaining trees
Remove trees attacked by beetles
Remove trees with severely damaged crowns or trunks
Burn slash piles promptly
Log in the fall possible
Remove all slash which may encourage beetles
Avoid piling slash against standing trees

Appendix 6
List of "A", "B" and "C" Lakes

Salmon Arm

Salmon Arm

L - Landscape Inventory -- Lakes that require a landscape inventory (including visual quality objectives) before submission of a Pre-Harvest Prescription within the area visible from the lake and surrounding Lakeshore Zone.

M - Management Plan -- Lakes that require a lake management plan before road construction or harvesting within 2 km. (May or may not include a landscape inventory -- will be determined as part of the planning process.) Walk-in and Protected Lakes automatically require a lake management plan.

P - Protected lakes -- No logging or development within the Lakeshore Zone. (Also require a lake management plan before road construction or harvesting within 2 km).

W - Walk-in -- Lakes to be managed for walk-in access only. (Also require a lake management plan before road construction or harvesting within 2 km).

Category A Lakes

L, W, P	Caribou (Shuswap)
L, W, P	Grizzly (Shuswap Lake Tr.)
W, P	Grizzly (Eagle R.)
W	Hidden (Eagle R.)
L, P	Kidney (Shuswap)
L, W, P	Liver (Shuswap)
L, P	Nellie's (Shuswap Lake Tr.)
	Pintail (Shuswap)
W, P	Reeves (Shuswap)
L, P	Skimikin (Shuswap Lake Tr.)
L, W, P	Wright (Shuswap Lake Tr.)

Category B Lakes

P	Black (Shuswap L. Tr.)
W	Bryden (So. Thompson)
	Chum (So. Thompson)
	Cranberry (Shuswap L. Tr.)
M	Cummings (Eagle R.)
	Dale (Shuswap)
M	Elbow (Shuswap)
M	Grassy (Shuswap)
L	Griffin (Eagle R.)
	Haggen (So. Thompson)
L, M	Harper (So. Thompson)
M	Holiday (Shuswap)
L, M	Humamilt (Shuswap L. Tr.)
L, M	Hunakwa (Shuswap L. Tr.)
W, P	Joss (Blue) (Shuswap)
W, P	Kanaka (Shuswap)
M	Kernaghan (Salmon R.)
M	Larch
	Little White (Shuswap L. Tr.)
	Miller (So. Thompson)
W, P	Morton (Shuswap)
P	Mosquito (Shuswap)
P	Noreen
W	Pement (So. Thompson)
	Phillips (So. Thompson)
M	Pisima (Shuswap L. Tr.)
M	Spruce (Shuswap)
M	Stoney (Shuswap)
L	Three Valley (Eagle R.)
L	Victor (Eagle R.)
M	Wallenstein (Salmon R.)
M, L	Wap (Shuswap)
L	White (Shuswap L. Tr.)

Category C Lakes

	Anstey (Shuswap)
W,P	Piper (Eagle River)

Vernon

Vernon

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Category A Lakes

	Arthur (Shuswap)
	Baird (Shuswap)
L, M	Bardolph (Okanagan)
L, M	Becker (Shuswap)
W	Bill Fraser (Shuswap)
	Bisson (Kettle)
	Bear (King Edward Area) (Okanagan)
L, W, P	Blackwell (Shuswap)
L	Bolean (Shuswap)
L	Bouleau (Okanagan)
W	Coalgoat (Kettle)
L	Crooked (Okanagan)
	Curtis (Shuswap)
	Damer (Okanagan)
L	Dee (Dee Lake Ch.) (Okanagan)
L	Deer (Okanagan)
L, W	Denison (Shuswap)
L	Doreen (Shuswap)
L	Echo (Shuswap)
	Edwin (Shuswap)
L, W, P	Ferry (Shuswap)
W, P	Finlayson #1 (Shuswap)
W, P	Finlayson #2 (Shuswap)
	Flyfish #1 (Shuswap)
	Flyfish #2 (Shuswap)
	Glenhayes (Proctor) (Okanagan)
L, P	Greenbush (Shuswap)
	Haqquist (Shuswap)
L	Hidden (Hupel) (Shuswap)
L, W, P	Home (Shuswap)
	Ideal (Belgo Dam) (Okanagan)
L	Island #2 (Dee Lake Ch.) (Okanagan)
L	Jimmy (Shuswap)
L	Joyce (Salmon R.)
L, W, P	Kate (Shuswap)
L	Keefer (Kettle)
L	Ladyking (Okanagan)
L	Little Bouleau (Okanagan)
L	Little Pinaus (Okanagan)
	Lost (Okanagan)
W	Nahm (Shuswap)
L	Nicklen (Shuswap)
L	Nugget (Shuswap)
L	Oyama (Okanagan)
L	Pillar (So. Thompson)
L	Pinaus (Okanagan)
L, W	Pond (Shuswap)
	Postill (Okanagan)
L	Pratt (Shuswap)
W	Rod (Dee Lake Ch.) (Okanagan)
P, W	Russell (Shuswap)
	Siglet (Shuswap)
	Silverstar (Shuswap)
W	Smoke (Shuswap)
L	Spa (Shuswap)
L	Spanish (Shuswap)
	Spec #1 (Shuswap)
W	Spec #2 (Shuswap)
W	Spec #3 (Shuswap)
L	Square (Okanagan)
L	Streak (Okanagan)
L	Sucker (Salmon R.)
L	Swalwell (Beaver) (Okanagan)
W	Two Moon (Shuswap)
	Valerian (Shuswap)
W, P	Whip #1 (Shuswap)
W, P	Whip #2 (Shuswap)
W	Wilma (Okanagan)
W	Wollaston (Shuswap)
L	Woods (Shuswap)
W	Walk-in Lake

Category B Lakes

Aberdeen (Shuswap)
Aileen (Shuswap)
Alex (Okanagan)
W Bonneau (Shuswap)
W Brunette (Shuswap)
Christian (Cartwright) (Shuswap)
W Dixie (Kettle)
Dixon Dam (Okanagan)
Drum (Upper Nicola)
W Ferguson (Okanagan)
M Gates (Shuswap)
Goat Mtn. Lake (Shuswap)
Haddo (Shuswap)
Harris (Shuswap)
Hidden (Oyama Area) (Okanagan)
High (Shuswap)
L Holmes (Kettle)
Hudson Bay (Okanagan)
Kaiser Bill (Okanagan)
Kathy (Shuswap)
Loon (Dee Chan.) (Okanagan)
Lost (Hidden) (Shuswap)
Lost (Nonie, Keefer) (Kettle)
Mau Mau (Shuswap)
McIntyre (Kettle)
Min (Okanagan)
Park Lakes (Okanagan)
W Parmateer (Kettle)
Pete (Shuswap)
W Pinnacle (Shuswap)
Polly (Shuswap)
W Porcupine
W Rottacker (Shuswap)
W Ruth (Okanagan)
Seaton (Okanagan)
Seidner (Lost and Found) (Shuswap)
Shiell (Kettle)
Sitkum (Shuswap)
Sowsap (Shuswap)
Towgood (Okanagan)

Category C Lakes

Arnica (Shuswap)
Barbe (Shuswap)
Beautiful (Shuswap)
Chatterton (Okanagan)
Christian (Bobby Burns) (Shuswap)
Clier (North) (Shuswap)
Conn (Shuswap)
Eryn (Shuswap)
Grizzly Swamp (Shuswap)
Holstein (Shuswap)
Ince (Okanagan)
Marsh (Shuswap)
M Mimulus (Shuswap)
W Mirror (Shuswap)
M Monashee (Shuswap)
Morrison (Shuswap)
Pritchard (Harry) (Shuswap)
Rankin (Okanagan)
Sinclair (Shuswap)
Stephans Lakes (Shuswap)
M Sunrise (Shuswap)
Target (Shuswap)
Thelma (Shuswap)
Twin (Kettle)
Will (Homestead) (Okanagan)

Penticton

Penticton

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Category A Lakes

L	Aeneas (Okanagan)
	Allendale (Okanagan)
P	Barge (Kettle)
	Bear (Lambly) (Okanagan)
	Big Meadow Dam (Okanagan)
W, P	Border (Similkameen)
L	Browne (Island) (Okanagan)
	Burnell (Sawmill) (Okanagan)
W	Chapman (Okanagan)
L	Chute (Okanagan)
	Clark #2 (Okanagan)
L, W	Corporation (Okanagan)
W, P	Corral (Similkameen)
W	Culper (Culver) (Okanagan)
L, W, P	Derenzy (Okanagan)
	Derickson (Kettle)
	Elinor (Eleanor) (Okanagan)
P	Fishhawk (Okanagan)
W	Geen (Okanagan)
L	Gemmill (Mud) (Okanagan)
P	Graystoke (Okanagan)
L	Greyback (Okanagan)
L	Hatheume (Upper Nicola)
	Haynes (Okanagan)
L, W, P	Headwaters #1 (Okanagan)
W	Hereron (Okanagan)
L, W	Howard (Okanagan)
	Hydraulic (Okanagan)
	Idabel (Cariboo) (Okanagan)
L	Idleback (Okanagan)
L	Jackpine (Okanagan)
L	James (Trapper) (Okanagan)
W, P	Joe (Similkameen)
W, P	Little Joe (Similkameen)
P	Little Susie (Similkameen)
W, P	Loch Drinkie (Okanagan)
P	Loch Katrine (Okanagan)
P	Loch Long (Okanagan)
P	Loch Lost (Okanagan)
P	Loch Oichie (Okanagan)
W	Loch St. Margaret (Kettle)
	Long Meadow (Okanagan)
P	Lost (Okanagan)
	Lower Barge (Kettle)
	Madden (Okanagan)
P	Mile High (Kettle)
P	Mission (Okanagan)
L	Munroe (Okanagan)
P	Murray Lake (W. Fish Hawk) (Okanagan)
L	Naramata (Okanagan)
W, P	Newby (Similkameen)
L	Nickle Plate (Okanagan)
W	Nuttal (Okanagan)
P	Park (Similkameen)
L	Pennask (Upper Nicola)
L, P	Pinnacle (Upper Nicola)
W	Ratnip (Okanagan)
	Red Bridge (Similkameen)
	Ripley (Bear) (Okanagan)
	Rose Valley Dam (Okanagan)
L	Silver (Okanagan)
	Shannon (Okanagan)
	Solco (Okanagan)
L	South (Okanagan)
	Testilinda (Similkameen)
W	Two John (Kettle)
W, P	Trapper (Similkameen)
	Whitehead (Okanagan)
	Yellow Lake (Similkameen)

Category B Lakes

Agur (Okanagan)
Banana (Okanagan)
Barton (Upper Nicola)
L Brenda (Upper Nicola)
L Cameo (Upper Nicola)
Canyon B. (Kettle)
L Christie (Okanagan)
Crescent (Okanagan)
Dale (Kettle)
Deep (Shuswap)
Dobbin (Okangan)
Eileen (Upper Nicola)
Ellen (Upper Nicola)
Ellis Resevoir (Okanagan)
Ern (Okanagan)
L Esperon (Okanagan)
Garnet Valley Dam (Okanagan)
Gellatley (Okanagan)
Glen (Okanagan)
L Headwaters #2 (Okanagan)
L Headwaters #3 (Okanagan)
L Headwaters #4 (Okanagan)
Hidden (Okanagan)
Isintok (Canyon) (Okanagan)
L Islaht (Okanagan)
Kilpoola (Similkameen)
Lily (Okanagan)
Little Hatheume (Upper Nicola)
Loon (Headwater Ch.) (Okanagan)
MacDonald (Okanagan)
Mahoney (Okanagan)
McCall (Dan White) (Okanagan)
W McLean (Okanagan)
Minnow (Okanagan)
Old Dave (Upper Nicola)
Paynter (Okanagan)
L Peachland (Okanagan)
Pear (Okanagan)
Peterson (Upper Nicola)
Pitin (Okanagan)
Porcupine (Upper Nicola)
Raymer (Upper Nicola)
Rat (Upper Nicola)
Rocky (Upper Nicola)
Rouse (Upper Nicola)
Sandburg (Okanagan)
L Spring (Okanagan)
Taylor (Okanagan)
Thirsk Reservoir (Okanagan)
Trout (Okanagan)
Toy (Okanagan)
West (Okanagan)
Windy (Upper Nicola)

Category C Lakes

Alki (Okanagan)
Art Pond (Okanagan)
Blue (Shuswap)
Brent (Okanagan)
Canyon A (Kettle)
Clarke #1 (Okanagan)
Crawford (Okanagan)
Duo Via (Okanagan)
Farleigh (Okanagan)
Frank (Okanagan)
Gallagher (Okanagan)
Glacier (Similkameen)
Green (Okanagan)
Guest (Okanagan)
Hayman (Okanagan)
Kathleen (Okanagan)
Knox (Okanagan)
Lebanon (Okanagan)
Lightblue (Okanagan)
Peanut (Okanagan)
Prather (Okanagan)
Reed (3-2) (Okanagan)
Robert (Okanagan)
Scotty Cr. Res. (Okanagan)
Spotted (Similkameen)
Stanhope (Kettle)
Tadpole (Okanagan)
Turtle (Okanagan)
Upper Twin (Horne) (Okanagan)
Waterlilly (Okanagan)
Webber (Okanagan)
Weddell (Okanagan)
White (Okanagan)
Wilson (Okanagan)
Wolfcub (Wolfe) (Okanagan)